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Committee on Education

of The

~~ASSEMBLY COMMITTEE ON EDUCATION~~
SUBCOMMITTEE ON HIGHER EDUCATION
~~CALIFORNIA STATE LEGISLATURE~~

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Held In
Board of Education Meeting Room
1025 Second Avenue
Oakland, California,

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CALIFORNIA
1961
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~~Wednesday and Thursday~~
January 22 and 23, 1958.

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ALICE BOOK
CERTIFIED SHORTHAND REPORTER
2844 VERNA WAY, SACRAMENTO 21, CALIFORNIA

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ASSEMBLY COMMITTEE ON EDUCATION
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A P P E A R A N C E S

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Assemblyman Harold T. Sedgwick, Chairman

Assemblyman Sheridan Hegland

Assemblyman Donald Doyle (Chairman of full Committee)

Assemblyman Richard Hanna

Assemblyman George Crawford

Assemblyman Don Anderson

James Marshall, Consultant

Blanche Hansen, Secretary

I N D E X

---oOo---

WITNESSES:	PAGE:	LINE:
Stanley E. McCaffrey, Vice-President-- Executive Assistant, University of California	4	20
	48	21
	53	15
	18	26
	57	9
Dean Morrough P. O'Brien Dean of the College of Engineering at Berkeley	19	11
	27	24
	45	7
	51	5
	56	9
Paul H. Sheats, Director, University Extension, University of California	35	15
Admiral Charles T. Singleton, Jr., Head, Engineering and Science, University of California Extension (Northern Section)	38	22
	205	13
Dr. J. Burton Vasche, Associate Superintendent of Public Instruction and Chief of Division of State Colleges and Teacher Education	74	22
	125	18
Joseph R. Decker Engineering Societies Personnel Service	104	18
Paul W. Little, Chief of Employment Service, State of California	112	19
Fred Harcleroad, Dean San Jose State College	126	2
	138	10
Norman O. Gunderson, Head of the Division of Engineering San Jose State College	126	15
	140	23
	213	1
Thomas E. Leonard, Head of Aeronautics Department San Jose State College	145	7

I N D E X

---oOo---

WITNESSES: (Continued)	PAGE:	LINE:
Thorburn E. Lyons, Coordinator of Training, Lockheed Missile Systems Division	151	8
Vernon B. Westburg, Executive Engineer Stanford Research Institute and Chairman of the Education Committee of the West Coast Electronic Manufacturers Association	171	20
Dr. Dudley H. Robinson, Chairman of the Division of Physical Sciences San Diego State College	178	8
Gerald A. Thomas, Chairman Division of Natural Science San Francisco State College	195	12
Ralph Marrs, Manager of Engineering Training with IBM, San Jose, California	200	11
J. Howard Arnold, Consulting Engineer 1058 Pomona Avenue, Berkeley 6, Calif.	216	23

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WEDNESDAY, JANUARY 22, 1958, 10:00 O'CLOCK, A.M.

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CHAIRMAN SEDGWICK: Will the meeting please come to order? I have a prepared statement that I would like to read in opening this meeting. It outlines our purpose here this morning.

We are here this morning in accordance with House Resolutions Number 280 and Number 285, which directs this Subcommittee to study the needs of higher education beyond the 12th grade.

The members of this Subcommittee, appointed by Donald D. Doyle, Committee Chairman, who is with us this morning on my left, are Carlos Bee of Hayward, who is absent; Don Anderson of Monterey Park; George R. Crawford of San Diego; Richard T. Hanna of Westminister; Sheridan Hegland of La Mesa; and Joseph C. Shell of Los Angeles, who is not with us either this morning. I am Harold T. Sedgwick of Oroville, Subcommittee Chairman. With us this morning also is the committee staff, James C. Marshall, Consultant and our industrious and obliging Secretary Miss Blanche Hansen.

I would also like to introduce the newest member of the California State Assembly from Berkeley, Mr. Don Mulford. We are happy to have you with us this morning, Don.

At hearings held at San Jose State College on November 14 and 15, 1957 we heard testimony on the need of the accreditation of the engineering schools at our state colleges with special reference to San Jose State College. At that time we heard

testimony from various representatives of the state colleges and industrial leaders, who told us about the policy adopted in 1953 by the California State Department of Education and the University of California which prohibited the state colleges from even seeking accreditation.

These representatives were unanimous in their opinion that there was a definite need for a policy change and a need to allow the various state colleges to seek accreditation by the Engineering Council for Professional Development, commonly known as the ECPD.

At the San Jose hearing we heard representatives of the California State Department of Education, who expressed doubt that there was a need for a policy change but stated that a joint committee of the department and the university was making a study which they hoped to be completed by January 1, 1958. Incidentally, since that time the committee has received word that the study would not be completed before March 1, 1958.

Unfortunately, at the San Jose hearing, due to a misunderstanding, no representatives of the University of California were present. We are all very happy to see that representatives of the university are here this morning, and we look forward to their opinions on this problem.

At the hearing today and tomorrow it is my hope that we hear testimony on the following subjects:

1. Further opinions by educators and representatives of industry on the need for accreditation of the engineering

schools at our state colleges. With respect to this subject it is my hope that a representative of the Department of Education will bring us the results to date of the joint committee study on this problem.

2. A comparison, or at least opinions from representatives of the engineering departments at both the state colleges and the university as to the curricula being taught at these respective type of institutions. I think it would be valuable to the committee to know the extend of the subjects being taught and the differences in courses at the state colleges and the university.

3. The actual need for additional engineers, both at the present time and opinions as to future needs. For this purpose we have invited a representative of the California Department of Employment to be present.

4. I think it would be valuable to the committee to hear from the various representatives of our institutions as to the extent of present facilities available and whether more students can be assimilated into the various institutions. In view of the President's recent announcements on proposed expansion of scholarships and the training of additional scientists, your State Assembly needs to know the status of plant facilities and the teaching staff available at our colleges and the university.

I think that the above generally outlines the subjects that we expect to cover during the next two days. Of course,

if time permits your State Assembly Committee would like to hear other problems that some of you may have with regard to our state colleges.

We have with us this morning representatives from industrial concerns in the Bay area, from our State Colleges, the University of California, from the State Department of Education and from professional engineering societies who are all concerned with these problems.

So that our Court Reporter can keep a complete record of these proceedings, it will be appreciated if you will state your full name, title, and whom you are representing before you start testifying. Those of you who have prepared texts, will you please present them to us at the beginning of your talk, so that we may more closely follow your presentation.

Now, I believe the first on our agenda this morning will be the representatives of the University of California and I would like to introduce at this time Stanley E. McCaffrey of the University who will present his panel and introduce them. Mr. McCaffrey.

MR. McCAFFREY: I have given copies of the statement to the reporter and to the press, but that just about exhausted our supply of copies of the statements. I hope that won't inconvenience the committee. We will try to speak plainly so you can understand it. I will introduce the members here as I proceed with this statement.

We of the University of California welcome this opportunity

to meet with this Assembly Education Sub-committee to discuss the matter of Engineering Education at the college and university level in the State of California.

Referring to Mr. Sedgwick's remarks, may I say that at the University regret that we didn't have representatives at the first meeting of the Subcommittee which was held November 14 and 15, 1957, in San Jose. A letter had been sent to Chairman Sedgwick from President Sproul of the University and from the State Superintendent of Public Instruction, Roy Simpson, under date of November 8, 1957, which indicated the entire subject of the engineering agreement had been discussed at the Liaison Committee of the State Board of Education and the Regents of the University at their meeting of November 5, 1957. That letter related that action had been taken at that meeting instructing the joint staff of the Liaison Committee to undertake a study of this subject and report back to the Liaison Committee. As a result of the discussion of this subject that the Liaison Committee meeting and the sending of the letter, it was the University's understanding that we were not to appear at the meeting. We understand that Chairman Sedgwick didn't receive this letter prior to the meeting held in San Jose and we sincerely regret that there was any misunderstanding concerning our failure to be represented. At any rate, we are here today and we are very happy to be with you to present information which we hope may be helpful to the members of this Subcommittee in giving consideration to this subject which we

recognize and join with you in the feeling is of so much importance to the people of California and indeed to our entire nation. I believe that what we will have to present to you will follow the outline you have indicated.

May I say a word concerning our University representation here today. It is my pleasure as Vice-president -- Executive Assistant of the University, to be here on behalf of President Robert Gordon Sproul. President Sproul wishes to express his regret he cannot personally be present but he has had long-standing speaking engagements in Southern California at this very time and thus is not able to be with us at these hearings. However, he has authorized me to speak on his behalf and to present information concerning the University's position on this subject. After my introductory statement, I should like to introduce other representatives of the University who can present information relative to other aspects of this subject.

First there will be Dean Morrough P. O'Brien, Dean of the College of Engineering at Berkeley who will present information concerning the University's approach to engineering education. I am sure you will find Dean O'Brien's testimony to be of interest and value.

With him is Professor Joe W. Kelly, Professor of Engineering and of Civil Engineering and Vice-chairman of the Department of Engineering-Special Programs, at Berkeley. He is available to answer any questions which may fall in his field here.

Following Dean O'Brien's presentation we would like to bring

you information concerning the engineering education offered by the University off-campus, under the auspices of University extension.

To present information as to what is done on the state-wide basis throughout the University will be Dr. Paul Sheats, Director of University Extension. Following Dr. Sheats, we shall be pleased to present Admiral Charles T. Singleton, Jr., Head, Engineering and Science, University Extension, Northern Section. Admiral Singleton will be able to bring us information concerning engineering and science programs offered by University Extension in the general Northern California region.

I know this Sub-committee is particularly interested in engineering education at State Colleges and the University within the State of California. As you consider this subject, I am sure you appreciate that it is very closely related to the fundamental subject of differentiation of functions among institutions of higher education in the State of California. The Legislature of the State of California, along with the State Board of Education and the Regents of the University, have long been interested in this general subject of coordination of public higher education in California.

As early as 1919 the California Legislature created a committee "to investigate . . . the plan of education in the state and the relations of schools, high schools, junior colleges, normal schools, technical schools, colleges and universities . . . and to make such recommendations therewith

as they deem of permanent benefit to the State."

Again in 1933 the Legislature created a State Council of Educational Planning and Coordination and gave it the responsibility "to study problems affecting the relationships between the schools of the public school system and the University of California, and to make recommendations thereon jointly to the State Board of Education and The Regents of the University of California through the Superintendent of Public Instruction and the President of the University of California."

In 1945 a Liaison Committee of The Regents of the University of California and the State Board of Education was established for this very purpose of coordination of public higher education in our state. Upon the recommendation of this Liaison Committee, the Legislature authorized a special committee--the Strayer Committee, appointed by the Liaison Committee--to study the development of higher education in our state. The Strayer Committee, in 1948, published its recommendations in its "Report of a Survey of the Needs of California in Higher Education." Continued interest in this general subject of coordination was expressed by all the aforementioned bodies, including the Legislature, and resulted in authorization by the 1953 Legislature of "A Restudy of the Needs of California in Higher Education." May I quote from "A Restudy of the Needs of California in Higher Education," published by the California State Department of Education in 1955, Chapter III: Functions and programs of Higher Education in California concerning

"Differential Functions of Public Institutions of Higher Education" page 86:

"One of the most far-reaching conclusions of the Strayer Committee report was that the junior colleges, the state colleges, and the University of California should play distinctive roles in California's program of public higher education. This principle of differential functions was stated as follows (pp. 26-27):

'The vocational or occupational level for which training is provided by these (state-college) curricula lies between the level that can be supplied by the two-year training of the junior colleges and the professional schools of the University. In any vocational or professional field, a group of workers is needed beginning with the unskilled and the semi-skilled and ending with the highly professional and research type. The unskilled and the semi-skilled learn what they need to know by pick-up methods. Skilled workers become such through apprenticeship or by mastering courses on the high school level. Technical programs have in California long been regarded as the province of the two-year junior college, while professional training is the province of the university. It is the level between the technical training of the junior college and the professional and research departments of the university towards which the occupational curricula of the state colleges are pointed.'

"In essentially adopting the Strayer Committee Report, the Board of Regents of the University of California and the State Board of Education endorsed the principle of differential functions. Presumably, then, this principle has guided the development of the state colleges and the University of California in their relationships to each other and to the junior colleges. The Strayer Committee proposed allocation of functions not as a negative measure, but as a positive basis for developing a diversified program of higher education and for meeting the varied needs of young people in the State of California with efficiency and economy.

"The principle of differential functions, then, is an important basis for co-ordinating the purposes and programs of public higher institutions. The liaison Committee has made considerable progress in such co-ordination."

The University of California firmly believes in this principle of differential functions for higher education in our state as among the three component parts of our so-called tripartite system of higher education, namely, the junior colleges, the state colleges and the university. We believe this is the best way for the state, within its financial limitations, to meet the higher educational needs of the people and economy of the state most effectively. The University has consistently guided its practices and policies upon this basic assumption and we still actively believe in this general concept. It seems to me it is appropriate to once again state here in this

connection that the University believes strongly and endorses heartily the splendid work and mission of the junior colleges and the state colleges of this State. We feel we have been a staunch friend of both the junior colleges and of the state colleges and we have endeavored to give every assistance and support to the accomplishment of their missions and in the conduct of their programs. We believe that both the junior colleges and the state colleges are doing an excellent job and that they are vitally important to the system of higher education in our State and to the training provided to our young people.

Now let me come specifically to a discussion of the subject of the Engineering Agreement. While I am sure the members of this committee understand the situation, there has been apparent misunderstanding on the part of some persons that the Engineering Agreement was an agreement set up by the University of California and, in a sense, imposed upon the state colleges. Actually, as I am sure the members of this committee know, this Agreement was entered into freely and voluntarily by members of the junior colleges, state colleges, and the University after participation by representatives of all bodies and was adopted by both the State Board of Education and by the University of California. The University is simply one participating member in the Agreement and not in any sense the author of it. I believe the members of this committee might be interested in the steps of action which brought this Agreement into being.

1. The Strayer Committee Report of 1948, with the

exception of the subsistence scholarship recommendation, was approved by both the State Board of Education and the Regents. On page 28 and 29 of that report is this recommendation on engineering training:

". . . It is recommended that the Regents of the University and the State Board of Education, through the Liaison Committee recommended elsewhere by this Report, continue the study of this matter and set up precise definitions of the distinctive aims and programs in engineering carried on by the University and the state colleges respectively."

Because of the above action, a study of engineering came to the Joint Staff in the fall of 1952.

2. On December 6, 1952, the draft of the Joint Staff report was reviewed by Arnold Joyal, President of Fresno State College, Harold P. Hayes, Dean of Engineering, California Polytechnic and Everett D. Howe, then Associate Dean of the College of Engineering in Berkeley, "to determine what the major issues are and to get suggestions for resolving those issues."

3. On December 10, 1952, The Technical Advisory Committee to the Joint Staff, after extended discussion of the draft of the agreement prepared by the Joint Staff, on the motion of Dr. J. Paul Leonard, then President of San Francisco State College, and seconded by Dr. J. Burton Vasche, Associate Superintendent of Public Instruction and Chief of Division of

State Colleges and Teacher Education unanimously adopted the following motion:

"a. That there is a field of engineering for the state colleges which they can work in with profit to students and the State;

"b. That a satisfactory designation of a degree in this field be named, either Bachelor of Arts in Engineering or Bachelor of Science in Engineering Technology;

"c. That a committee of engineering representatives from the University and the state colleges together with the Joint Staff attempt to set up criteria as sharp as possible which would differentiate the programs of engineering in the state colleges from those in the University, and which criteria the Technical Advisory Committee recommends be applied by the State Board of Education in reviewing the present engineering programs in the state colleges, none of which have as yet been approved, as well as other proposals for the establishment of engineering programs in other state colleges which might arise."

4. In accordance with the last item in the above motion, as approved by the Technical Advisory Committee, the Joint Staff requested Dean Hayes of California Polytechnic, Professor Ralph J. Smith of San Jose and Dean O'Brien of the University of California "to submit criteria which in their judgment would differentiate the engineering programs at California Polytechnic,

the other state colleges and the University." These suggestions were used by the Joint Staff in developing the characteristics of engineering in the state colleges and the University which are a part of the Engineering Agreement.

5. On February 11, 1953, the Liaison Committee of the State Board of Education and the Regents, after extended consideration of the Joint Staff report, on motion of Mr. Blair and seconded by Mr. McLaughlin recommended to the State Board of Education and the Regents approval of the Joint Staff report.

6. On February 27, 1953, both the State Board of Education and the Regents unanimously approved the above recommendation of its Liaison Committee.

7. On March 10, 1953 in a joint letter signed by Dr. Simpson and President Sproul, the Agreement as thus approved by the two parent boards was transmitted to Administrative Officers and Staffs of the State Colleges and the University of California. The following is taken from that letter of transmission:

> "These recommendations now become policy for the State Colleges and the University of California and we anticipate that the administrators and staffs of the several institutions under the jurisdiction of the respective boards will develop ways and means of carrying out these policies in both the letter and spirit with which they were adopted."

As I noted at the outset of my remarks, at the Liaison

Committee meeting of November 5, 1957, there was discussion of this subject of the Engineering Agreement. I believe it is appropriate to mention that at that meeting the University representatives and particularly President Sproul, took a very active part in discussing the advisability of considering revision of the Engineering Agreement. The actual fact is, as the record will show, that President Sproul joined in making the motion that a study be made by the Joint Staff to ascertain full factual information concerning this matter and to report back to the Liaison Committee. As this committee no doubt knows, the Joint Staff has been fortunate in obtaining the services of Dean Emeritus George L. Sullivan, for 36 years Dean of the Engineering School of the University of Santa Clara, to direct the fact-gathering for that study. I wish to say, on behalf of President Sproul, that he awaits with real interest the report of the Joint Staff and if that report indicates that revision of the Engineering Agreement is advisable, he in no way opposes revision. He does feel that it is appropriate and advisable to await the report in order that full facts may be presented but that upon receipt of the report, he is agreeable, if the report so indicates, to a revision of the Agreement.

I hope this above review concerning the Engineering Agreement has made clear the following three points: First, that it is not the Agreement of the University of California but that we are merely one party to it and that the Agreement was entered into freely and willingly by the several parties;

secondly, that we have joined in requesting that a study be made of all the factors related to the Engineering Agreement; and thirdly, that we are not opposed to a revision of the Agreement if the facts indicate that such is advisable.

Now finally as far as my remarks are concerned, I believe this committee will be interested in and I am sure, please by, the steps being taken by The Regents of the University of California to accelerate and expand work being done at the University on a statewide basis in science and engineering and immediately related fields. In fact, at their November, 1957 meeting, The Regents took the following action:

> "That, in the light of existing conditions and the grave need for expanded programs in the education of scientists in the United States, a supplemental budget be developed and presented to the State authorities, requesting additional funds for the areas of the physical sciences, mathematics, and engineering, including a request for such additional capital improvement funds as may be necessary in connection therewith."

Subsequently very intensive study has been given by members of the faculty and administration on all campuses of the University as to those projects which suitably should be accelerated in order to comply with this policy direction of The Regents. At their meeting of last Friday, January 17, 1958, The Regents gave approval to a program and budget in the approximate amount of $12,500,000 for personnel and facilities

for accelerated and expanded programs in physical sciences, mathematics and engineering, which budget will be presented to the forthcoming session of the Legislature. May I say that these programs are both on-campus and off-campus activities. The University feels a very deep responsibility both for training students on campus and those who have completed basic engineering courses who must attend off-campus courses, in order to expand our pool of qualified personnel in these technical fields in the light of latest national and worldwide developments. Dean O'Brien, Dr. Sheats and Admiral Singleton will present to you more detailed information as to the University's on-campus and off-campus programs in these fields.

There is one phase of work which may not be described by these gentlemen and yet which I think is of interest to you and has very basic importance to this whole subject of scientific training. For the past two years, the University of California both at Berkeley and Los Angeles, in cooperation with the National Science Foundation, has conducted programs of training for high school science teachers. These are intensive eight-week programs by which a total of some 300 high school science teachers are given very thorough and intensive indoctrination to expand their knowledge of their respective fields and to become better prepared for their important work of science instruction in the high schools of our State. We feel this represents an important contribution to science education and we are happy to say that these programs will be conducted once again this year even though the National Science Foundation has

earlier found it necessary to curtail its support in a rather substantial amount.

May I conclude my remarks by saying that The Regents of the University, the administration and the faculty, feel very keenly and strongly their responsibility in higher education in the State of California. We wish to do everything within our power to meet our obligations whether it be in engineering, science, or the liberal arts field. This has been our endeavor through the 90-year history of this University; it is our endeavor today and shall be in the future. We feel it is of the utmost importance that careful thought be given to planning and coordination of higher education in this State in order that the public dollar may be most wisely and effectively spent so that the best possible job can be done in every respective field. So it is in engineering education that we think there must be planning and coordination in order that the State's needs may be met in the most economical and effective manner. We commend this committee for its interest in this field and its intelligent approach to this important problem. We hope that the information we present here today may be helpful to you in your considerations.

Now I think Dean O'Brien can provide specific information on the University in regard to engineering education.

CHAIRMAN SEDGWICK: Would you mind if we ask you a few questions before we get into Dean O'Brien's presentation?

MR. McCAFFREY: Go right ahead.

ASSEMBLYMAN DOYLE: Mr. McCaffrey, you mentioned you wanted

it made clear to the Committee, which interested me because I didn't know the answer, that the University of California was not the instigator of that agreement. Would you say that the state department was or the state college presidents were or the State Board of Education or how did this come about? Who instigated the agreement?

MR. McCAFFREY: I think it is possible Dean O'Brien can answer that more accurately than I. I wasn't on the scene at the time and I think he was. If it is all right with you I would like to call on him to answer it.

DEAN O'BRIEN: I think the real origin of the agreement was the developing program in the state colleges in engineering which had resulted from this demonstration of a need for the kind of program which is stated in the agreement. And that is rather thoroughly described in the Strayer report. We claim ourselves it is practical, but the use of the term had significance there. The feeling was that there was an opportunity in the technical field for a four-year program which did not go the whole route in science and analysis that the professional program in the University did, but which would provide men for many technical functions in manufacturing and in sales and in other branches of the overall technical fields. Of course, that is a new departure in this country, to have two engineering programs. They are available in Europe and almost all industrial nations, but in this country we have never had that parallel approach, so it was desirable to have some definition and I would

say the drive to define these boundaries was more from the state college side than from the University side.

ASSEMBLYMAN DOYLE: Did the agreement follow the Strayer report straight down the line?

DEAN O'BRIEN: Yes. I should say it followed that quite closely, yes. It of course refined it and defined it more accurately, but it was in conformity with the ideas of the Strayer report, yes, sir.

ASSEMBLYMAN DOYLE: Do you know whether or not or how many members of the State Board of Education might have served on this Liaison Committee that you mentioned, Mr. McCaffrey?

MR. McCAFFREY: Normally, let's see, I think there are four from the State Board of Education and four from the Regents of the University. Then there is the President of the University and the State Superintendent of Public Instruction. I am not certain if the membership changes from time to time, Mr. Doyle, but there are several members, I believe, were still on from both groups who were put on earlier.

ASSEMBLYMAN DOYLE: Do you know whether or not all of the State College Presidents agreed to this?

MR. McCAFFREY: That I don't know. I don't know that any of them disagreed with it. Certainly there is nothing in the record to indicate that. It is possible Mr. Vasche -- later I understand he is going to be appearing before you. He may be able to supply accurate information on that. I know the University agreed to it along with all others who were asked to

sign it and complied with it.

DEAN O'BRIEN: The work on it was a joint effort of this joint staff, so-called State Board, the University of California joint staff, one man each. They did the work, so that was the real drive behind it, but the request to define this parallel approach and to give standing to it came from the state college side.

ASSEMBLYMAN DOYLE: Thank you.

CHAIRMAN SEDGWICK: Any other questions?

ASSEMBLYMAN ANDERSON: Mr. McCaffrey, you indicated that the Regents had approved the request for more funds to expand this program. Would you say it's been a lack of funds that has prevented your carrying a gradual program into the Santa Clara Valley area that we heard about last fall?

MR. McCAFFREY: In general there is a drive of course throughout the country and Mr. Sedgwick referred to it and then President Eisenhower's program which he has discussed on national radio broadcast was presented to the congress for an expanded program. Now, as it applies to the University I would say mainly it is an accelerated program that we have had planned but for which we have not had funds. Now, specifically as far as the Santa Clara Valley situation is concerned, most of that program is carried on without public funds. It is through university extension and is self-supported. However, there are certain aspects of it such as the facility in which classes can be held and we might have more resident personnel which we

feel will be very effectively accelerated by the supplemental budget request. Both Admiral Singleton and Dr. Sheats are going to enlarge upon that particular phase of it.

ASSEMBLYMAN ANDERSON: Providing you get the funds you would be happy to take the program down there for them?

MR. McCAFFREY: Yes, we have plans for the establishment of a university center in Santa Clara Valley and offering a graduate program in science and engineering in that area.

CHAIRMAN SEDGWICK: Assemblyman Crawford.

ASSEMBLYMAN CRAWFORD: Yes, with regard to this request for an additional million plus, are you able to indicate how many additional graduates this would provide?

MR. McCAFFREY: The actual detailed data is now being assembled and of course will be presented to the Legislature when that request is being made. I would hesitate frankly to guess at this moment the number of graduates that will, or additional students that will be able to accommodate. However, that information is being accurately determined by our faculty at this time and is being reviewed by the University and will be presented to the Legislature as of this coming session. This is a statewide program. It isn't just one campus, it is both on-campus and off-campus and it unquestionably will affect many hundreds of students and enable us to enlarge both on-campus and off-campus programs which will in effect bring education to many hundreds of new students not only in engineering but in physics and chemistry and other of these particularly important

scientific fields related to missile development, space and so forth.

ASSEMBLYMAN CRAWFORD: Now, I understand --

DEAN O'BRIEN: I have something I would like to say on that point. Part of the need is to take care of the students that we have, especially the graduate area. We don't have the proper space to accommodate them. I don't want you to get the impression this will take care of more students. We are in a difficult strait over what students we have in the engineering field at Berkeley.

ASSEMBLYMAN CRAWFORD: Then it is quite possible this additional request for money would not end in additional graduates?

DEAN O'BRIEN: It will avoid a decrease. Nuclear engineering has no space at Berkeley at all.

MR. McCAFFREY: The exact detail on this as I mentioned, Mr. Crawford, will be presented the best we can do it when this budget request is presented as to how many more students this will enable us to takecare of. Dean O'Brien indicated it will enable us to better take care of the advance students in nuclear engineering and so forth in Berkeley. In the other areas I know the plans are for an expansion.

ASSEMBLYMAN CRAWFORD: Now, in the restudy there is this statement, "It is recommended therefore that the junior colleges continue to take particular responsibility for the technical curriculums, the state colleges for occupational curriculums,

and the University of California for graduate and professional education and research." Now, can you tell me whether the Regents are in agreement with this particular statement?

MR. McCAFFREY: Yes, that is essentially the program that has been followed for some years.

ASSEMBLYMAN CRAWFORD: Then the only possible point of contention that might exist on the different levels of education in the field of engineering is a definition of the type of say research that is necessary for the particular levels of education such as you would need a certain amount of research even for a technical curriculum. You would perhaps need more research in occupational curriculums and when you go into the professional education with its more or less pure research that would take a different type of research.

DEAN O'BRIEN: I think the technical programs require laboratories, but I don't think they engage in research or need research facilities.

ASSEMBLYMAN CRAWFORD: What about occupational curriculums?

DEAN O'BRIEN: Normally one would not include research in that type of program. They need extensive laboratories for instruction of students.

ASSEMBLYMAN CRAWFORD: Well, for instance in our San Diego area where we have what we like to think is a missile center of the United States today, where there is a very real need for properly qualified occupational graduates, certainly there would be a need for a certain amount of research before that person,

whether it is in the classroom or conducted studies, it is necessary for a certain amount of research before this person is qualified to take his place in an occupational position.

DEAN O'BRIEN: I don't think any school in the country is giving a bachelor's degree in engineering in regard to research as part of that program. I say there are extensive laboratories to demonstrate problems but no research department for graduate students.

MR. McCAFFREY: It is to help meet the need, for example, both in the San Diego area which certainly is one of the centers in the State and in the country for missile development, and that advanced area is so important today that the Regents, as I am sure Mr. Hegland and you know and the others know, have adopted the policy and it has been approved by the Legislature that you have as the first step in this new campus in San Diego area an institute of science and technology. That actually is getting under way now and as far as the research and the professional personnel they contribute to that field, it certainly is the design of that university and that institute of science and technology to actively work in that field. In fact, the tentative plans call for a close cooperation and coordination between some of the very highly qualified technical personnel in industry in that area to work with the institute of science and technology in helping meet the shortage of faculty and instructors who are capable in these fields.

ASSEMBLYMAN CRAWFORD: Well, it was my understanding that

there is disagreement at the present time as to the site. Now, I believe that the citizens of San Diego voted a certain area for the University of California, Rancho La Jolla, and now the Regents seem to feel this is not a proper area for construction.

MR. McCAFFREY: No, the subject where the general campus shall be is actively being considered. It was simply the Regents' feeling that before investing a great deal of the State's money and other funds which have been contributed, some from private industry, in one place, that it was wise to take a fairly quick look within the space of a couple of months to see that the right area was being chosen because this university will be there for ages in a sense rather than arbitrarly proceed on what in some ways is a rather restricted site. However, the Regents intend to reach a decision on this in the immediate future and hope to decide upon it at the February 21 meeting of the Regents, which they are going to hold in La Jolla next month. So that the study, I feel, on the part of the University, as far as the University is concerned is not a misunderstanding or disagreement or lack of certainty but rather a careful survey to be sure right steps were being taken in the right places before this great investment was made.

ASSEMBLYMAN CRAWFORD: Now, can you tell me just one further question. Is there still an objection on the part of the Regents to state colleges seeking accreditation?

MR. McCAFFREY: I tried to cover that in my statement. Speaking for the President of the University, his position as I

stated is that we feel that it is appropriate that the results of this intensive study which is now being made, which is to be reported as we understood it, by March of 1958, whether that is March 1 or March 30, I understood it was March 1, that the results of that study should be awaited and theoretically, as we understand it, the full facts concerning all aspects of the situation are being ascertained in that study. If that study indicates that changes should be made in the engineering agreement, President Sproul and the University are not opposed to changes. We say the change would include various aspects of the agreement, including that concerning accreditation. I don't want it to be understood or applied here now that the University says that it favors the state colleges seeking accreditation. What I have said and repeat is that we would like to await the results of the study and if that study indicates certain changes should be made, as it may well, the University is not in any sense going to oppose those changes.

ASSEMBLYMAN CRAWFORD: Thank you.

CHAIRMAN SEDGWICK: Would there be any objection if we continue with the other testimony? I think these questions that are being asked are interferring with some of the other testimony.

MR. McCAFFREY: I do think some of those points that were asked will be covered by other gentlemen.

DEAN O'BRIEN: I am happy to have this opportunity to make comments on engineering and engineering education. In our work on it -- I have more of an outline than a statement, but I will

try to stick to it. There will be some interpolation so that the statement I have given will not be complete.

The time lag between a student's decision to study engineering and the acquisition of professional status is too long for the educational plans of institutions or of individuals to be based on current shortages or excesses of graduates.

No short-range, urgent current problem of national security will be solved or greatly relieved by education. Five years is the minimum time in which a radical change of any kind could produce an appreciable effect, and most educational changes require longer to be effective. That applies even to increases in capacity.

There is a long-range trend toward an increase in the ratio of engineering personnel, sub-professional and professional, to total population, not only the population increase but per million of population the number of engineers and technicians will continually increase. This trend should be provided for in the development of the state system of engineering education. There does not exist now and has not existed for several years in the United States, a shortage in the number of engineers who have completed the conventional bachelor's degree program. In fact, a temporary over-supply may occur when the next class graduates in June, 1958.

However, education of engineering personnel in the United States has not adequately met the need for two other groups other than the bachelor graduates from the conventional program.

On the one hand there is a shortage of engineers qualified by education and experience to direct, and to contribute creatively towards, the application of recent discoveries in science to the development of novel engineering equipment and systems. This need is numerically small, amounting to 15 to 20 per cent of the total number of engineering bachelors graduates. On the other hand, there is an unfilled need for the training of supporting technical personnel, draftsmen, surveyors, laboratory technicians, inspectors, and so forth. Between these two groups, lies the area of engineering practice served by the conventional bachelors programs, and one adequately supplied, I believe, for the past several years.

The need for creative engineer-designers, qualified by education and experience for the highly analytical and scientific areas of engineering practice, should be met by an increased bachelors graduates who prepare for this type of work by at least one year of work of graduate studies. In those areas of engineering practice which are intimately dependent upon new developments in science such as electronics, metallurgy, sanitary engineering, and many others, the four-year engineering program is no longer adequate. Too many of the engineering graduates, innately qualified for this type of engineering, terminate their education at the bachelors degree.

Off-campus programs of study for practicing engineers provide increased knowledge and competence in specialized areas but they are inadequate to satisfy the first deficiency mentioned

for two principal reasons: (1) Only a few students complete a related sequence of courses and (2) the work is more of an extension of undergraduate instruction, with emphasis on learning and what others have done or discovered, that it is an introduction to creative, independent thinking, the primary objective of graduate study.

The alluring prospect of a full-time job at a good salary plus the opportunity for graduate study has caused too many students, who are qualified for graduate work, to end their formal studies at the bachelors degree. Few of these graduates later undertake any graduate work and fewer still complete the graduate program. Ten years later they are likely to regret that they did not continue for at least one graduate year.

Accreditation of engineering curricula, (schools are not accredited), should be a matter of fact. If the state colleges desire to be accredited and feel that they are qualified for it, they should act through their established channels of administration to request an inspection by the Engineers Council for Professional Development. Now there are two things about accreditation which seem to have been overlooked, at least not mentioned widely. Accreditation has no bearing now on registration for professional practice in California. Anyone may take the examination by paying the fee. The second point is that the graduates of non-accredited colleges are accepted for graduate work at Berkeley on the basis of their record and their instructors' recommendation. We pay no attention whatever

to accreditation in accepting graduate students. It is entirely on the basis of individual records and comments. However, if the program a student follows is in fact accreditable, then he deserves whatever prestige or privilege goes with accreditation. Whether the institution involved were supposed to be accredited or should be accredited is one thing, the rights of the student to the advantages of accreditation I think should also be considered.

After World War II, the state colleges made a case for meeting the need for a type of program falling between the professional program of the university and the terminal program of the junior colleges. In my opinion this need is real and should be met, but I have the impression that the California State Polytechnic College is the only state college which now has this objective. I may be mistaken in this and I am not intimately acquainted with it all, but having visited Cal-Poly on quite a number of occasions I feel they are making a real try on the objective which is an important one. Many of the graduates of such programs will, after the period of experience necessary for graduates of all engineering schools, qualify for professional practice in some phase of engineering. Now, accreditation tends to deflect programs towards the conventional pattern and ultimately to exclude students who are practically inclined and who do not have the aptitude for mathematical and scientific analysis.

Now, on this point I would like to mention one fact about

engineering education elsewhere. All of the industrial nations of Europe, including Russia, provide two engineering programs, one closely related to current engineering practice in a particular industry and taught on a part-time basis by practicing engineers, and the other based strongly in mathematics and science and intended as preparation for creative design, development, and research. One of these programs is not better than the other. They are different and are intended to prepare different types of people for different job opportunities. The system of engineering education visualized in the Strayer report seemed to promise the development of a similar system here, but adjusted to the needs and attitudes of this country, but it does not seem to be developing generally in this direction, with the exception I mentioned, namely, Cal-Poly.

These notes have dealt thus far with my opinions on questions which can be variously answered. A few facts about engineering at Berkeley are appropriate to indicate its scope.

Following the tremendous peak of veterans in engineering immediately after the war, our student numbers dropped to a low point, corresponding to the low birth rate of the depression period, and has since been climbing steadily.

I don't know whether it is worth taking the time for details as to numbers, but we have grown from a total student population in Berkeley of 1800 in 1954 to 2500 in the fall of 1957. And the number of degrees, of course, has remained almost constant because the low spot hits the freshman year first and

moves up through the curriculum. Our graduates have been growing from 333 in 1954 to 484 in 1957.

Now the most notable fact about our growth in recent years is the increase in graduate students from 212 in 1954 to 470 in 1957. This growth has been most rapid in the fields in which industrial expansion has also been rapid -- electronics, nuclear engineering, metallurgy, sanitary engineering, and others.

As an example of the sort of change which has occurred, in electrical engineering, which is in these days mostly electronics, the number in 1952 was 61 graduate students, and the number in 1957 is 141. Nuclear energy, which we did not offer in 1952, has now in 1956 had 42 graduate students. In 1957 it had 63. Naval architect, a subject which we have carried on for many years, one of four institutions in the country offering this field, had zero students, zero graduate students in 1952, had 8 in 1956, and 18 in 1957. I mention these facts to stress this point about the growth of graduate study which until the war and even until five years after the war was mostly an added duty. It was not a major objective.

As I have indicated by these comments we now feel that graduate study is a major objective for us at Berkeley and the numbers are growing fast and we are having some difficulty taking care of it. Our problem is that our student body has increased more rapidly than our capacity in faculty, offices, laboratories, and shops, and the shortage is most acute in the newer fields such as nuclear engineering. We are badly over-committed to the

graduate students now registered in that we do not have available the space and facilities which they will need in the near future for research.

Now as to the type of program offered at Berkeley, we hope to prepare the graduates for practice in the areas of design, development, and research, as specified in the Regents' State Board Engineering Policy Statement. Obviously, the graduates will chose whatever line of work they prefer after graduation, and engineering graduates are found in almost every occupation, but our program aims to prepare them for the type of practice described. We award the bachelors degree at the end of four years, but our curricula are being revised on the premise that they constitute the first four years of a five year sequence, including one graduate year.

Engineering at Berkeley has collaberated with the junior colleges for many years. More than half of our graduates have entered at the junior year. I regard this as a good division of effort because most of the junior colleges provide adequate preparation and because they offer the student the opportunity to make up for high school deficiencies, to assess his abilities and interests and change objectives without penalty or frustration, and to save the expenses of the first two years, possibly for a year of graduate study. I also feel that the University should conserve its resources for upper division and graduate work and limit the lower division to a group sufficient only to keep us in touch with lower division problems.

Thank you.

CHAIRMAN SEDGWICK: Before we continue, I think we will have a five-minute break.

(Thereupon a five-minute recess was taken.)

CHAIRMAN SEDGWICK: The Committee will come to order.

MR. McCAFFREY: If it is agreeable to the Committee, I would like to call on Paul Sheats, Director of the State-wide Extension Course.

ASSEMBLYMAN HEGLAND: Pardon me, might I ask two or three questions of Dean O'Brien before we continue? These have to do only with Dean O'Brien's testimony.

CHAIRMAN SEDGWICK: Well, I would like to let these gentlemen finish if you don't mind.

MR. McCAFFREY: You go ahead, Mr. Sheats.

MR. SHEATS: This will be very brief, Assemblyman Hegland, so you will get to your questions rapidly. There have been a number of references made to the off-campus program and my comments have to deal particularly with the offerings state-wide and I shall then ask Admiral Singleton to refer particularly to the situation in the northern area.

I think you all understand that even in the case of the off-campus offerings in engineering and science all of these programs, while administered by university extension have their academic controls resting with the appropriate university departments or professional schools.

Off-campus offerings of the University of California are

of two main types: (1) Post professional or special programs designed to upgrade trained professional scientists and engineers as well as technicians, and (2) formal courses including a number of graduate offerings which are designed for the completion of degree requirements.

Now, let me give you a couple of examples of these two types. In the first category, these post-professional or special programs, we have given modern physics for the engineer, a series of 16 lectures offered in five locations throughout the State with a total enrollment of 1246; Space Technology, a series of 32 lectures by nationally known scientists and engineers offered in five locations with a total enrollment of 4360. As far as I know this is the largest enrollment for any single extension course in our history, and this series has attracted national attention by virtue of special reports in the Wall Street Journal and the New York Times and I will be glad to give to your secretary a graphic copy of the story in the Times covering this series. The programs will be kinescoped for television and published in book form. The Colleges of Engineering at Berkeley and Los Angeles, in cooperation with The Ramo-Wooldridge Corporation, have planned this pioneering effort to present a sound exposition of the principles underlying the development of long-range ballistic missiles.

Now, as regards the second type of off-campus programs, regular classes in engineering, physical sciences and mathematics, the University is now offering high level instruction in support

of the guided missiles programs, nuclear engineering, and for the improvement of science instruction at the high school and junior college levels.

I want you to get some idea of the growth in this program in the last year or two. Comparative statewide figures for the fall semester of 1957 and the fall semester of 1956 show a 16 per cent increase in the number of classes offered and a 13 per cent increase in the number of individuals participating. The figures for 1957 are 2172 classes in which 11,616 adults were enrolled. Examples of courses in the guided missiles field are: Experimental Stress Analysis, Jet Engines, Gas Turbines and Rockets, High Temperature Alloys, Vibration and Shock analysis. We estimate that about 80 per cent of our offerings are related to the defense effort with many directly supportive of the guided missiles program and nuclear engineering.

Graduate programs have been offered by the University, administered by University Extension at Livermore, China Lake, Point Mugu, Orange Belt, San Diego, and Downey-Long Beach area. Two hundred and six graduate students are currently enrolled in these off-campus centers. There is a new Extension Center opening in San Francisco this week and proposals have been made for the establishment of additional centers in the near future.

Vice-President McCaffrey has already referred to the Supplemental Budget which the Regents of the University have approved at their January meeting. Included in this budget is provision for two University Centers, one in Santa Clara County

at which programs in engineering, the physical sciences, and mathematics could be offered. These have been the two pressure points in terms of the development of industrial areas, particularly related to these fields.

I know of no state university in the country which in the current emergency is providing a wider range of off-campus educational opportunities to industrial and scientific personnel employed in the guided missiles field than is the University of California. Moreover, the entire operating cost of these programs has been paid from non-State funds.

It has been partly paid by student fees and partly in many cases by contracts with the interested industries.

Now the administration of this program in the Northern Area has been the responsibility of Admiral Charles T. Singleton, an Annapolis graduate with 34 years of Navy duty behind him including personal participation in the Navy's guided missiles training program and its postgraduate engineering offerings. He has given fine leadership to the development of the Northern Area Program and he may have some comments he wishes to make about that particular field.

MR. McCAFFREY: Will you proceed, Admiral Singleton.

ADMIRAL SINGLETON: Mr. Chairman and gentlemen, the Committee in announcing this hearing indicated particular concern for certain engineering and scientific fields, particularly guided missiles. I am sure, however, that its interest extends over the total higher educational opportunities available in

California in all the technological fields which contribute to our meeting the needs of modern society.

And therefore actually, Mr. Chairman, I address myself entirely to the second objective that you stated and that was the extent or availability of education at present.

As indicated by Director Sheats, significant offerings have been made throughout the State by University Extension of the University of California. The activities of the Northern Area in the fields of Engineering, Physical Science and Mathematics, which are my particular responsibility, have been steadily increasing over the years to meet the new and changing public requirements. In consonance with the Statewide data given you, the formal classes organized in the Northern Area in these fields in the academic year 1956-1957 were 236 with an enrollment of approximately 4,700 students. In this year 1957-1958, 348 classes have been initiated, and based on the fall semester just ending, this year's enrollment will be approximately 6850. As would be expected, the increase in key industrial areas has been significant. Our work in the Redwood City-San Jose area has risen in one year from 9 to 25 per cent of our total and in Sacramento from 2 to 9 percent. All of our formal classes are taught by the best teachers available from both faculty and industry, are predominantly postgraduate and professional in character, and are offered under the guidance and supervision of the respective academic departments of the University.

I would like to review briefly some of the formal offerings

of University Extension over the past several years in the fields of today's concern. In Chemistry, which field directly supports our space age propulsion and energy problems, courses in Mass and Infrared Spectrometry, Chromatography, Nuclear Chemistry, etc. have been presented by outstanding authorities in the field. Typical of the level of such presentations is the spring 1958 offering in Heavy Elements which will be taught by a group of experts including Professor Glenn T. Seaborg, Nobel laureate in Chemistry, and Professor Isadore Perlman, Chairman of the Department of Chemistry at Berkeley. Our course program in Nuclear Engineering has drawn on the internationally recognized staffs of the College of Engineering at Berkeley, the Radiation Laboratories at Berkeley and Livermore, and the industrial leaders of the field which are located in this area. Approximately 20 of the spring 1958 classes will deal with Nuclear Engineering and the Physics and Mathematics supporting this specialization. Among these will be: Nuclear Chemistry, The Heavy Elements, Chemical Engineering Processing of Nuclear Materials, Introduction to Nuclear Reactor Materials, Radioactivity and Nuclear Structure, Introduction to Solid State Physics, Neutron Physics.

At least 40 of the 191 classes to commence in February are in direct support of guided missile development, about 21 per cent of total offerings. Among them are: Logical Design of Digital Computing Machinery, Experimental Stress Analysis, Circuit Analysis, Feedback Control Systems, Transistor Circuit

Analysis, Advanced Communication Theory, Microwave Transmission and Radiation, Mechanisms and Dynamics of Machinery, High Temperature Alloys, Vibration and Shock Analysis, Jet Engines, Gas Turbines and Rockets, and Fundamental Problems of Space Flight.

Special summer programs which have been or are being organized by University Extension in coordination with respective departments of the University at Berkeley are: Nuclear Engineering Industrial Course, which is a 9 weeks course for people or engineers in industry who wish to specialize in the nuclear field. It has been nationally recognized and it has been given at the University in 1955-1956-1957 and will be given in 1958. There will be a Nuclear Engineering Survey for Executives Course for people in management who are concerned with nuclear matters. This is a one week's course and it has also been highly recognized and was given in 1956, 1957, and will be given in 1958.

This year we are initiating a course which has been referred to before, Nuclear Engineering Training Institute, which will be an eight week's institute for selected nuclear engineering teachers selected from throughout the country. It will be given in 1958 for the first time. Mentioned previously also, we will give Science Seminars for Junior College Teachers which will cover three Seminars of four weeks each in 1958, which are actually to prepare the junior college teachers in the Freshman and sophomore subjects in engineering at junior colleges.

Then there is a Health Physics and Industrial Nucleonics Program which is under development and will undoubtedly be given in the summer of 1958.

Presently under development for use in the fall of 1958 are Study Programs presenting comprehensive groups of courses to insure students detailed and continuing developments in subjects of current emphasis such as: Nucleonics, Electronic Data Processing, Feedback Control Systems, Reaction Engines, and Transsistors, Also there has been completely organized, and it will be presented in September, beginning in September of 1958, a Statewide program of Modern Mathematics for the Engineer which will present on a 16 lecturer series throughout the State the outstanding mathematicians of the country in special methods of application of mathematics to today's engineering problems.

Now, I am sure that this Committee is fully aware that none of the course programs, Special Summer Programs, or the Statewide lecture series referred to by Dr. Sheats are conceived, organized and presented without considerable effort. In this regard, it is significant to point out that almost a year elapses between initiation and presentation of a program. During this period all resources of the University, University Extension, and other contributing agencies are taxed and it is only by such coordination that high-quality programs are produced. For example, Modern Physics for the Engineer, presenting some of the most distinguished physicists of the country, during the fall of 1957, was initiated in the fall of 1956. Space Technology, a program which commenced on 13 January presenting

36 scientists whose names are now continuously in the headlines, was initiated in March of 1957. The formal course in the Fundamental Problems of Space Flight which opened in Palo Alto on 18 September, 1957, was organized in January 1957. I have cited these examples to emphasize our endeavors to serve in a timely way the engineering and scientific needs of the State, programs of post-Sputnik character conceived and developed in a pre-Sputnik atmosphere.

MR. McCAFFREY: Mr. Sedgwick, that completes our prepared presentation and naturally we would be happy to answer any questions that members of the Committee may have.

ASSEMBLYMAN HANNA: I think I can best put it to you gentlemen in the way of a comment and then go back and ask a question specifically on the comment. I would say as an introductory statement that following what Mr. O'Brien said about our not going to meet this problem with engineering demands overnight, my inexperienced conclusion derived at through well-organized ignorance is that the United States characteristically in a crisis such as we are in attempts to do too much too soon and that the -- I should say we try to do too much too late and as the crisis levels off we try to do too much too soon in cutting back. I hope we won't do this in the educational program. I would like to make five comments and then ask a specific question on the five comments.

These five comments are around this area, that we should face this problem from the standpoint of where we are, not from

where we should be or where we were meant to be under the divisions that we have made between our state colleges and our universities.

My comment is that the faculties that have been chosen to carry out the program that has been closely delineated and divided are not the kind of, or I question whether they are the kind of faculties that will achieve these ends.

Secondly,about the students -- is it not possible that the students that we are trying to serve take to the facility that is nearest to them because of financial or other considerations and not because of their ability to be either in the occupational class or the professional class?

Thirdly,about the communities -- do the communities in which the state colleges now exist understand and agree with the divisions that have been so set forth as delineated in the Strayer report?

Fourthly, I would say about our Legislature and its fiscal responsibility. Can the State of California afford a full-blown statewide program of the divisions such as we are contemplating? I think this question we ultimately, the legislators, must face.

And fifthly, do we have the kind of centering of responsibility that can give us the correct answer to these first five?

Now, let's go back to the first one. Which one of you gentlemen feel that you can make a comment that will throw some light on this business about the faculties that we have in our state universities? Do they understand and are they in accord

with the aims that are set forth in this division?

MR. McCAFFREY: Mr. Hanna, those five questions I think we can at least give our opinions on. I think I could comment on the second, third, fourth, and fifth, but the first one I think Dean O'Brien would be best qualified to comment on about the faculties.

DEAN O'BRIEN: I mentioned in my comments the two kinds of engineering programs found in almost all industrial nations of Europe, particularly in Germany and Holland and Switzerland and Belgium. The practical -- perhaps I should say "practical" programs, the programs aimed at preparing men for a particular industry are located in areas where that industry is dominant and most of their instructors are men who are employed in industry. They are practicing engineers who also teach. For example, in Hamburg they have the engineering school of the practical kind which is devoted to the shipbuilding industry. Up and down the Rhine you find quite a number of them devoted to heavy machinery. There are others devoted to preparing men to be engineers in the electronics industry, designing equipment there. So that is the kind of instructor which I think is needed, at least a portion of the staff should be of that type in the kinds of school that I am thinking about, and it is the kind of school which corresponds to the middle group in the State-Board-Regant-Strayer Plan.

ASSEMBLYMAN HANNA: Is this the kind of faculty we characteristically will find in the state colleges in the State of California at the present time?

DEAN O'BRIEN: No, I think there is a built in resistence to that kind of faculty in the state colleges first because of the requirements, the tendency of the State Board and the state colleges to require a man of academic type preferably with a Ph.D. In my opinion I would like a rule if you are setting up a practical kind of program leading to professional practice. One rule would be no Ph.D.'s. The other rule is that those who teach the engineering courses should have had about five year's experience in industry.

ASSEMBLYMAN HANNA: Then, would you not agree, sir, that what we are and what we should be to carry out the full intent of the division that was contemplated in the report are two different things at the present time?

DEAN O'BRIEN: Well, about this matter of objectives -- one of the best statements you can hear is that which the President of Cal-Poly will make and when I talked with him recently he said his principal point was the matter of faculty because most of the men teaching engineering or even graduates, they have a tendency to think Berkeley is fine and doing something like it is a good objective.

I say always in the environment of the state college liberal arts or general programs, it is very difficult to create an atmosphere which would make possible the practical kind of engineering program I have mentioned and which I said existed in Europe, which I think Cal-Poly is trying to develop. It is a very difficult problem because we don't have other schools as

an example and we have not made that kind of program respectable, we have not made it understood. But industry is going to go to Cal-Poly as it is to other state colleges. But Cal-Poly is beginning to develop a reputation in industry for the particular program. I would like to site as an example the Welding Engineering Program in Cal-Poly which aims to give the student not only a knowledge of the usual engineering subjects, strength of materials and some others, but those which also qualify them to do the welding job so that when they visit the welding shop as representatives of one of the companies seeing welding equipment, when they go in as an engineer to advise on a welding process, they can take the equipment in hand and do the job as well as talk about the metallurgy and the structure and strength and stress and so forth.

ASSEMBLYMAN HANNA: You are speaking now of the quality of the program which I think is also very important?

DEAN O'BRIEN: The example of the kind of program is the welding and they have others. In this matter of accreditation I would like to make it clear I am not against accreditation of state colleges. If they develop a program which is accreditable, I think the students deserve accreditation. I think we are missing an opportunity not to develop the parallel kind of program you find in the industrial areas of Europe which in Germany is receiving tremendous support from industry. A representative from the German General Electric is chairman of a committee which is trying to expand those schools and

strengthen them and they feel that both kinds of schools are urgently needed and they are taking graduates from both and they are both achieving full professional status if they go on and acquire the experience which is required.

ASSEMBLYMAN HANNA: May we have the answer to the second one about the problem with the students and where they may be?

MR. McCAFFREY: I think in this first question on faculties, as I understand the study being developed by the joint staff that they are also including that aspect in the study being made on the engineering agreement. Now, you asked secondly about students and as I understood the idea was, don't students go to the institution of higher education nearest them rather than selecting the course they wish to follow and then go to the school where that course is offered? I realize that --

ASSEMBLYMAN HANNA: I think more particularly without regard to what their actual qualifications might be. In other words, we might have here a chap of Santa Clara Valley whose aptitudes eminently qualify him to be a professional engineer, but if he is in Santa Clara Valley, my thinking is, he is more apt to become an occupational engineer.

MR. McCAFFREY: I think Dean O'Brien can comment on that also, but let me lead off on it. I don't believe the record will show that. Now, I hesitate to make an absolute statement on it because I am sure everyone of us can think of exceptions to this, but the University of California, just on any one campus, take Berkeley as the oldest campus, draws students from every

county in the State. I am sure in engineering in Berkeley you will find students from certainly a complete distribution of the State. The University is designed to offer its courses for students from all over the State. Now, to supplement that there are of course the campuses of the University in several different sections and there will be new campuses at the University established in San Diego area and the southeast, Los Angeles, Orange County area, and in the general South Central Coastal region. My own experience and I believe that of the University would indicate that if the students demonstrate or indicate a desire and qualifications to pursue a particular kind of course, that not only do they follow through on that desire by going to the school whether it is public or private that offers the best course along that line, but more and more they are encouraged by the councilors in high schools to do so. Now, there is a provision in the tripartite system in higher education and all of us have recognized that the junior college helps meet the financial situation here. So many of the young men and women simply can't because of financial responsibilities to their family and their own limitations go away from home. Thus there are many, many students and more and more of them take their first two years of college training at a community college which we call junior colleges and those are located, as you know, in virtually every community in the State, so that about student can within driving or commuting distance attend a junior college and can prepare for advance work in even technical fields at

other institutions. Now, finally I would like to say that we know innumerable students who have no support from any other source but support themselves 100 per cent at the University of California. I know the same is true of even private institutions like Stanford where students go a considerable distance away from home.

I wouldn't want to say there aren't students as you have stated from Santa Clara Valley who went to San Jose State because it was convenient and it was the best thing maybe in their situation, but the general record will indicate that students go to the school eventually where they feel they will be getting the course they wish to follow.

ASSEMBLYMAN HANNA: I think just to clarify why I said this, I think our record from the hearing at Santa Clara will indicate that this was part of that hearing that they did state that there at the San Jose State College they did have students who should be and who would be qualified to take this complete course in professional engineering and they were there primarily because the college was there.

MR. McCAFFREY: I think you will find that students in all the colleges of the State, public or private who are qualified, who have the intelligence to go to other schools. Well now, why they are there and not at other schools, I wouldn't want to try to say.

ASSEMBLYMAN HANNA: Would you say that we have made it clear enough to the students what this division is? Do you think

it is clear in every student's mind when he goes to a State college at the present time that he is going for occupational engineering or that he is going for professional engineering? Do you think we have made that message clear to the students?

DEAN O'BRIEN: One of the questions is whether there is that real distinction. San Jose State has a very good program and a good student going there will get practically the same subjects as though he came to Berkeley for four years. To be quite frank about it my son is just finishing an engineering program and I told him he couldn't go to Berkeley because it would be embarrassing when I threw him out. So we talked about colleges and the one we considered was San Jose. I thought that was a good place for him to go. It has a good program of mathematics and engineering and is quite satisfactory. So you aren't really making this distinction because the student doesn't have that choice.

ASSEMBLYMAN HANNA: I made that distinction because I said we better talk about two things, what we are and what we ought to be. If we are talking about what we are, we are talking about your statement on San Jose. If we are talking about what we ought to be, we are talking about the setup where we would have practical engineers teaching occupational engineering.

DEAN O'BRIEN: I think most of us in engineering feel that the arrangement we are working under in which most of our graduates have come from junior college is a very satisfactory one because first it does save some money. Second, it gives the

boy a chance to think what he really wants to be. If he goes there and changes his objective, he has no feeling of frustration. He merely changes the words on the card and he is in another program. If he comes to us and we have to drop him out of college of engineering, he feels frustrated, so we are trying to get on the basis of accepting as freshman only students who have a high probability of going on. We invite many students in to talk about careers and advise them to go to state colleges, junior colleges, whatever seems to fit, and we think this junior college-university system is working very well, and it has great advantages in money and this opportunity to decide to make up for high school deficiencies. It is a scheme I hope we can continue to work on and we at Berkeley will. I would say also that professional engineering is for most communities an export business.

I have the feeling that if more California communities knew more facts about the mobility of engineers they would be more interested in this practical kind of program related to their local industries. That has varying implications throughout the State, but engineers move everywhere and you can almost tag the man if he takes engineering he is going to move from where he now lives to some other part of the country because that is the nature of engineering and of industry. But local communities have quite a stake in educating people I think for their own area and that was I thought one of the objectives of the regional college. Professional engineering leads to mobility and movement.

No engineer now worked in the area where he lived before he studied and they are moving, not only around California, but from one part of the country to another which is good for the profession and good for industry, good for students.

One point you asked was about the distribution. We have studied the origins of our students at Berkeley and per million of population the weighting in favor of the Bay Area is only about 2 as compared with San Diego. We get almost as many students per million of population from San Diego as we do from the counties in this region. So at least Berkeley serves the State.

MR. McCAFFREY: Would you like me to proceed to try to answer these other questions?

CHAIRMAN SEDGWICK: Yes, if you will please.

MR. McCAFFREY: I think your third question had to do with communities and I suppose the industry and individual communities, whether they understand and agree with this so-called allocation of function or distribution of function and so forth. Well, I don't know that we at the University could answer that or that we would be authortative on it. There are a number of things on which we could comment. I think Dean O'Brien's comment concerning engineers, where they go and what they do, is somewhat pertinent, that for the most part engineering isn't found in every community. It is found in centers which have been noted here earlier and fairly well known to you, missile work and so forth, and that kind of very technical research isn't found in

every community. But there is of course the practical, the administrative, the occupational engineering found in most communities, virtually every community. I wouldn't want to say that all the communities and thus all the firms and businesses of the State understand and agree with this agreement. I think if they understood it they would feel it had more logic.

I think every business concern has its own particular interest and there are certain things that will meet and satisfy that industry best. I might go right on in this legislative thing, you really raised the question as to whether you folks and the legislature and your colleagues there have enough money to distribute to meet the needs. Well, our point, as the University indicated in the remarks about our belief in the differentiation of function, is that there must be planning and coordination to in a sense assign or delegate certain responsibilities to certain institutions in a positive rather than in a negative way because if every institution in the State tries to do the same thing, you will end up with at least two results, one, less quality, watered down on the part of all of them, and certainly more expense. Now, speaking of research, it isn't just a matter of starting research, as I'm sure all of you gentlemen know. Research costs money. It cost money not just for the people doing it but for the equipment and for the physical facilities to house the equipment. It isn't just initial cost.

The University of California often refuses grants or gifts for research equipment simply because we know we cannot go to the Legislature year after year on succeeding years to request in

many cases 100 thousand dollars or more which are necessary annually to support activity on that piece of equipment, as for instance reactors that are offered. The average annual cost, depending upon the reactor is somewhere around 100 thousand dollars just to support that piece of equipment. It sounds nice to get a reactor but we don't accept a lot of these things offered to us because they are too expensive to maintain, so from the standpoint of watching the dollar, there's got to be overall planning and coordination which, of course, in the final analysis becomes your responsibility. You allocate or appropriate the money.

Finally, I think I wasn't quite clear on that question but it had to do with centering of responsibility. Would you mind --

ASSEMBLYMAN HANNA: What I wanted to know is who is responsible to see that -- let me put it this way. We are discussing this problem of accreditation. It appears to me that if we were dealing with a state college, university division, that fell along the lines that Mr. O'brien was talking about we wouldn't have very much problem about accreditation. But if we are going to continue with the "swoose" half a swan and half a goose business, we are going to have recurring this problem of whether we should give the accreditation to bring them up to being the swan and not the goose, if you see what I mean. Now, we have got to have responsibility in the direction and in this division that you have made so that it stays clear or

you give these kind of problems to your legislators and I personally wouldn't want to walk right into the swinging windmill under the present circumstances and say, "Gentlemen, fall back." Or else step the other way and say, "Well, we are all going to go in the same direction at the same time." That is what I mean. Where is the responsibility?

MR. McCAFFREY: I think that is certainly an important point.

DEAN O'BRIEN: I would like to say I am carrying the ball to some extent for accreditation of the practical program because it leads to professional practice for a large percentage of those completing it. It is different. It leads to different introductory jobs but certainly some of the German schools of this type have produced men of greater ability in the engineering field. I learned about them first from a friend who is general manager of the Jet Engine Department of General Electric. He graduated from Mittweida in Germany. I talked to him many times about his education. He covered substantially the same subject that our students do in mechanical engineering in his undergraduate years. He graduated from high school, then spent two years becoming a journeyman machinist which is a requirement to enter this practical school. Then he spent three years on mechanical engineering in which the same subjects were covered but were covered in a different pattern. Design was the central theme. They did a series of problems, simple at first and increasing in difficulty. There were critics of each problem by

a small class of instructors, all of whom were from industry. Related to this pattern of design were all of the subjects we cover, strength of materials, fluid mechanics, and dynamics and metallurgy and so on, but they were related to a series of problems. It produces men of a different viewpoint, produces men who are primarily engineering designers and industry in Germany uses a great many of them even in their research laboratories.

MR. McCAFFREY: Speaking to this subject, I would like to just go back to this community support. I think it is pertinent to know that the University of California and I believe this was established actually through the Legislature some years ago, has a very active engineering advisory council. Is that not established through action of the Legialature?

DEAN O'BRIEN: No.

MR. McCAFFREY: The Regents of course approved the recognized body on which there are many leading representatives of the leading business and industrial firms in the State and they constantly consult and advise with the colleges of engineering and the University at Berkeley and Los Angeles.On the matter of responsibilities certainly the State Board of Education on behalf of the state colleges and the Regents on behalf of the University bear a very heavy and important responsibility in this regard and the reason the Liaison Committee of these two groups was set up was to provide coordination between them. Now,

I would certainly hope and expect the University has this belief that their present study is going to contribute toward a solution to this problem. I don't know that it will solve it completely. We are hopeful that it will certainly contribute to a solution, and the University representatives have that approach and desire and I am sure the State Board representatives do too. I won't say the Legislature doesn't have a real interest in it and a responsibility also beyond those of the two boards because I am sure you do and when it comes to allocation of funds which enables the implementation of any of these things, you are the last word on that.

CHAIRMAN SEDGWICK: Does that answer your question?

ASSEMBLYMAN HANNA: I promise not to ask any more. I am satisfied.

CHAIRMAN SEDGWICK: Mr. Hegland.

ASSEMBLYMAN HEGLAND: Dick's questions helped clear up my confusion. First I want to comment on -- this is my own comment -- on the extension service. I think California University is doing a wonderful job in its extension service. I hope you men come in and ask for State funds to operate that. I know this class in San Diego is very popular and is doing a real fine job. We really believe in equality of educational opportunity. This equality of educational opportunity should not be more costly to take into Plumas County than it is at the Berkeley Campus. That is, if it is the same course, and western colleges tell me it is sometimes even a little bit

better in a few areas. It is a little outrageous to have a person in Plumas County pay something a person in Berkeley doesn't.

Now the two questions of Dr. O'Brien -- you made it pretty clear I think from your own personal view that you believe in differentiation in function across the board in all fields of academic persuit, including engineering.

DEAN O'BRIEN: I don't know about that.

ASSEMBLYMAN HEGLAND: In your own field in engineering you do. Now, in this philosophy of differentiation of dunction, has the Strayer report to your knowledge or the restudy to your knowledge, including the differentiation of function, ever been approved by the Legislature?

DEAN O'BRIEN: Has it been approved? It was in response to a resolution, sir.

ASSEMBLYMAN HEGLAND: This is when the study started, but has the study ever been approved after it was submitted?

DEAN O'BRIEN: I don't know.

MR. McCAFFREY: I believe the process on that, and I am not necessarily an expert on this, the process is this, both studies were made at the request of the Legislature. They include besides general reports, certain recommendations. You will recall that in the restudy, for example, one of the recommendations had to do with the establishment of State scholarships, which I know you have a real interest in. I believe then that the Legislature receives the report, but acts

upon the individual recommendations individually. I don't know that the reports have been approved.

ASSEMBLYMAN HEGLAND: It probably was an unfair question. Now, if we do believe in the differentiation of function, Dr. O'Brien, and if we take current opinion of the ECPD, who voted I believe overwhelmingly against accrediting of the second type of program that you mentioned three or four years ago after they had studied it and rejected the proposal of the parallel programs as leading to accreditation. I believe that is accurate, but anyway, up to date ECPD has not been willing to accredit any program that is not professional so would it not follow that if we do take the assumption that we believe in differentiation of function and we take the current attitude of ECPD plus their past history, that we will not be accrediting any courses or curriculum in the State colleges?

DEAN O'BRIEN: Well, I don't know what you refer to by this vote. That may be the committee on which Dean Boelter and I served. They once proposed what they called bifurcation.

ASSEMBLYMAN HEGLAND: Which was rejected.

DEAN O'BRIEN: It was rejected by the schools more than the committee. The schools said that that was not what they wanted, but actually the members of the committee, a great many of them felt that it was a mistake, but they did feel that the emphasis placed on the basic sciences in that report and other features of it were worth approval. Dean Boelter and I threatened to resign. Finally we decided to get the report out, and I

would like to say this, I don't see why everybody is excited about accreditation.

In this thing it means nothing for the Registrar. There is no bar against those students going to be graduate students at Berkeley. So, I think it is considerably exaggerated. I think the State ought to do what is good and not worry about ECPD.

ASSEMBLYMAN HEGLAND: Forgetting the argument as to whether or not accreditation is good, is it not true you and Dean Boelter found yourselves in a minority position in the ECPD?

DEAN O'BRIEN: Let me say this, if you look at the schools accredited, there are unaccredited schools in this State which I would say are superior to the some of the accredited schools. When it says ECPD rejected this other program, they really didn't look at the facts. Almost no school in the country except perhaps ours and a few others are nowhere near what ECPD recommended in that. Many of the people involved say it wasn't a good goal. Furthermore, that is not the ECPD, that was the Committee of the American Society of Engineering. The ECPD is a group appointed by the Engineering Societies which probably was influenced by this report but not controlled by them.

ASSEMBLYMAN HEGLAND: All right, well I don't want to push you in a corner. Isn't it true generally speaking that if we accept the philosophy of differentiation of function, and if we adopt the current dominate majority point of view in the engineering profession, that we will not be accrediting? We will

not have courses of instruction at San Jose and Fresno?

DEAN O'BRIEN: I didn't say that. I think if you ask for accreditation, you will get it.

ASSEMBLYMAN HEGLAND: That is not the question. The question is if we accept the true philosophy of differentiation of function and there is only one state college in this State which is really adopting it and that is the up-side-down program at Cal-Poly, if we adopt this philosophy, Cal-Poly would not get accreditation.

DEAN O'BRIEN: If there were a really well-known and good example of that in this country, it would be accredited because there are many people like Dean Potter, one of the great leaders in this field who is impressed by Cal-Poly, and his feeling was that is the sort of thing that should be accredited. But if they asked for accreditation they would be pushed into something different so he advised waiting.

ASSEMBLYMAN HEGLAND: I agree with you, but then we will ask Cal-Poly when they do testify as to whether or not they believe they could today be accredited and maintain the philosophy of the up-side-down program, and I am confident the answer will be, no, not under existing philosophy of ECPD.

DEAN O'BRIEN: I am trying to understand your point. Are you saying the State shouldn't do what is needed because ECPD doesn't approve it?

ASSEMBLYMAN HEGLAND: I am not saying what is right and wrong. I am not saying whether or not accreditation is desired or not desired or whether ECPD is correct or not. All I'm saying

is if the profession which you represent and Dean Boelter are engaged in, if you take that major philosophy, that major philosophy would not now encourage the accreditation of the up-side-down program in Cal-Poly.

DEAN O'BRIEN: Well, you said the major profession I am engaged in. You mean the ECPD which is a small group of men mostly professional?

ASSEMBLYMAN HEGLAND: Well, I give you --

DEAN O'BRIEN: I would like to get clear on this point because first I feel the importance of accreditation is exaggerated. Second, if there were several Cal-Polys or if Cal-Poly were a little older, it would be accredited. Third, if you speak of the profession I represent, I find an increasing number of engineers in the companies I deal with are impressed with what is being done at Cal-Poly and are taking students from there; and fourth, I have been actively engaged in industry as a consultant in jet engines and rockets in two fairly large companies. I can't remember a time when we paid any attention to whether a man was from an accredited school or not. We hardly paid attention to what school he was from. I just think this whole thing is greatly exaggerated and that what really needs to be talked about is what should be done in the State. If it is well done and leads men into professional practice, they will be accredited.

ASSEMBLYMAN HEGLAND: I am not at this point saying whether accreditation is good or not and I think the area of at least

different emphasis between the two of us are brought out. Now, on this question of research, would you give me your own personal definition of the word "research"?

DEAN O'BRIEN: Well, it is the search for new relationships and new facts in nature. It is not the application of those facts, it is the search for new facts, new relationships in nature.

ASSEMBLYMAN HEGLAND: Is it totally new knowledge or is it new for the particular student who is learning something?

DEAN O'BRIEN: It is new knowledge.

ASSEMBLYMAN HEGLAND: All right, then if we take the other definition of research, which is that apart of the learning process is that the youngster must be encouraged to discover certain things for himself, then in that sense research is essential even in the fifth or sixth grade levels of our public school system?

DEAN O'BRIEN: I think so.

ASSEMBLYMAN HEGLAND: In order to have this research, whether it is new knowledge or new for the student, you have to have equipment to permit the student to discover again something which may have been discovered a hundred years ago. You have to have research equipment in that sense, is that not true?

DEAN O'BRIEN: I would say that is a strange use of the word. It shouldn't be called research.

ASSEMBLYMAN HEGLAND: This is the use which a hundred thousand public school teachers give to it in our public schools.

DEAN O'BRIEN: All right.

ASSEMBLYMAN HEGLAND: If this is true, if research is discovering things new for the student or for the class and that is important, then in our state colleges, contrary to the 1953 agreement, don't we have to have research equipment?

DEAN O'BRIEN: Then, you have used the word in an entirely different sense. There was no part of the agreement which used the word "research" tnat had the research in mind that you have in mind. That was not contemplated by anybody I heard talk about it. Certainly it was not in the mind of the people who drafted it. Certainly, it would be a great distortion of the term as we use it if research in that agreement had to do with the kind of research you refer to.

ASSEMBLYMAN HEGLAND: Our Chemistry Department at San Diego State College has recently been turned down on applications for equipment because they were told that this was research equipment and not instructional equipment. Now, this may become somatics very rapidly, but if we are educating youngsters, they have to have the opportunity to have the laboratories and the equipment to provide information which is new to them. Now, --

DEAN O'BRIEN: That it was instructional or research?

ASSEMBLYMAN HEGLAND: We had to justify every one of our applications on the ground that this was instructional and not research because research was denied to us under the 1953 agreement. This involved a certain amount of almost hypocrisy on the part of the people asking for the equipment and the part

of the people finally granting equipment. We had to justify everything on the basis it was instructional and not research.

DEAN O'BRIEN: So did we.

ASSEMBLYMAN HEGLAND: You take both kinds of equipment in Berkeley.

DEAN O'BRIEN: We have grants strictly for instructional purposes and we have to be sure we aren't found using this equipment exclusively in the research laboratory. There has been a lot of equipment recently which was strictly for instruction and we are not to use it for research except incidentally.

ASSEMBLYMAN HEGLAND: Mr. Crawford has a question.

ASSEMBLYMAN CRAWFORD: Is research in the sense that you use it necessary for a Master's degree?

DEAN O'BRIEN: Yes. No, I shouldn't say that. It is necessary for the Master of Science Degree. It is not necessary, not required in some other programs, for example physics, where I think research is really for the Doctor's Degree. In our engineering emphasis is on design, not research.

MR. CRAWFORD: Have you had an opportunity to examine the faculty and facilities in San Diego State College?

DEAN O'BRIEN: I visited there a year ago and met a number of people.

ASSEMBLYMAN CRAWFORD: As I understand it, before an institution is accredited, the team is made up of members --

DEAN O'BRIEN: This is engineering accreditation?

ASSEMBLYMAN CRAWFORD: The team is made up of various

members from various institutions to go and examine the faculty, and the facilities, and the program?

DEAN O'BRIEN: Yes.

ASSEMBLYMAN CRAWFORD: Now, from the knowledge that you have as to the present faculty, program and facilities at San Diego State College, and the additional hypothetical fact that you were a member of this team, would you be in favor of granting them accreditation for their engineering program?

DEAN O'BRIEN: I think I would be, but I certainly have to look at a lot of other things. Research is not considered. It is not part of it in any respect. It may be a consideration of quality, but the examination is as to the particular set of courses and instructors who teach those courses. Now, I haven't done that. I visited there and visited the physics department and met some of the engineers. The main committee that looks at this does ask some questions about how many faculty they have in proportion to students, whether that adds up to what the committee would accept I don't know.

ASSEMBLYMAN CRAWFORD: I will admit that is a difficult question because the present controversy between the state colleges and university present a conflict.

DEAN O'BRIEN: It is a controversy of a peculiar kind. I don't feel I have any controversy with state colleges, and I would like to get it on a factual basis now since the deed is done for some of them. They ought to go ahead and ask for accreditation and see what happens.

ASSEMBLYMAN CRAWFORD: Thank you.

CHAIRMAN SEDGWICK: Do you have a question Mr. Anderson?

ASSEMBLYMAN ANDERSON: I don't want to belabor this point on the principle of differentiation of function, but I need to be cleared up. Dean O'Brien has indicated that there is only one state college that is really following this principle at the present time within their department of engineering. And as he put it, to follow this principle he would recommend that a state college engineer faculty not include Ph.D.'s.

DEAN O'BRIEN: For the engineering courses.

ASSEMBLYMAN ANDERSON: And also that same faculty for the engineering courses should have five year's experience within industry. Now, would you recommend that inasmuch as we have only one of the state colleges following this principle, that we take steps to encourage the other schools to adopt this?

MR. McCAFFREY: Do you mean as far as applying to what Dean O'Brien said as to qualifications of faculties?

ASSEMBLYMAN ANDERSON: Not necessarily qualifications, but to get back on the differentiation of function.

DEAN O'BRIEN: I said that would be the characteristics of the kind of school I was talking about. I didn't say it should be applied to state colleges. I also said in the environment of a state college in which they have science, liberal arts and so forth, I think it would be difficult to develop the kind of school I am talking about. It has to be an independent institution in which engineering as a dominant

factor like Cal-Poly is successful.

ASSEMBLYMAN ANDERSON: We are not going to accomplish it within our state colleges in California?

DEAN O'BRIEN: I don't think so.

MR. McCAFFREY: I think that in the United States and particularly in our State there should be a further differentiation in engineering training. However, I think maybe this is your question. I don't think that is being done except at Cal-Poly and I think it would be very difficult to very promptly make the change and Dean O'Brien makes the point and a lot of people in engineering agree with him, that there is a great need there and it isn't being met. That is regretable and unfortunate, but whether other state colleges or other institutions will wish to meet that need, I share your doubt that they wish to make the change to endeavor to meet it.

ASSEMBLYMAN ANDERSON: Then we will have to modify this principle which we are using or are supposedly using as a basis for engineering instruction in the state college system?

MR. McCAFFREY: I am sure the very reason the new study of the agreement is being made is that there is a recognition that the old agreement was not necessarily being followed by all members, and secondly, that we should take a new look at the situation, the circumstances, and the needs of the time, and then find out what the facts are concerning what is being done and the need from the standpoint of the student and industry and the national requirements and endeavor to frame a

new agreement of some kind which would guide all of our efforts toward a mutual goal. I say very possibly -- I don't know that there would be a new agreement. I don't know at this point that there will be a change in the other one, but there certainly is some expectation that the results of the study will indicate there will be some changes that should be made, but I would think that some kind of agreement would be desirable again in order that there be coordination to see that we are not all trying to do the same thing. I am sure that would result in great expenditure of money that the Legislature wouldn't feel able to support.

ASSEMBLYMAN ANDERSON: And at this time we will all be informed and there will be plenty of publicity so that community institutions, the Legislature, people and students know exactly what we are following?

MR. McCAFFREY: In any new agreement I would certainly hope so.

DEAN O'BRIEN: First, I would like to say that personally I would like the job of running that school and starting it. Secondly, when the Strayer report was made, Dean Boelter and I said, "Please have a study of engineering itself." It is worth as much effort as the whole Strayer report because you are going to spend that much money. When the 1953 report was made we said the same thing. When the Regents' agreement was made we said the same thing and each time we are told, "There isn't time. It is too late." I have been one of those pushing the national

study of the engineering profession because there is so much confusion about the nature of engineering, what kind of education they need, but right here in California we need a real study of engineering education which isn't going to be done by March 1 and what worries me is every bob-tailed short study has come up with erroneous conclusions, unreliable facts and you had to pack up and do it over again on a hasty basis when somebody pushes it. What we need is a thorough study of engineering education along with the national study.

It will take two or three years to do it. We don't have decent statistics as to how many engineers there are, what they do, the turnover, and a whole lot of facts are needed about the nature of engineering. And all of that needs a thorough study and it would save the State a lot of money and do a lot of good if it were made on a thorough long-range basis. If they say, starting in 1947 every time this matter came up that it was too late -- we asked the State University and they said the study had to be done by a certain date. I agree there were deadlines involved but the fact is that at this stage we don't know the things we should have known as the basis of the Strayer report in 1947.

ASSEMBLYMAN CRAWFORD. Circumstances have changed since that time.

DEAN O'BRIEN: Still we don't know. The national societies are behind this and have put up money to develop the program to take it to the Ford Foundation or elsewhere to get a

thorough study of engineering profession because there is a lot of nonsense of what is needed. The societies themselves are not clear on it because it covers such a large field. You run into all sorts of things when you come to define a profession by what engineers do. When you get to the hazy boundary of men who are partly technical and partly managers, who go off into sales engineering, and you get into some real problems as to what you ought to do to educate them.

In my opinion there is much over-emphasis on mathematics as a requirement for practical engineering. That is what worries me about the present situation. We excluded the practical boys and we give great emphasis to those that are analytical and we have an unbalance.

ASSEMBLYMAN ANDERSON: It was reassuring to hear you make the statement that there are no bars for graduate study on students from non-accredited schools except their own record, because at San Jose hearings the inference was made that such was not the case. But I am concerned, too, about the graduates of non-accredited schools who are out in industry and who it was indicated at this same hearing were being discriminated against in the way of job opportunities and advancements and things of that sort, and we had testimony on this point from people from industry in Santa Clara Valley. Do you have any comments to make on that?

DEAN O'BRIEN: In the first place, in industry very few men are registered, not the entire engineering force. In the

industry there isn't much emphasis on registration except for certain groups which might cause a public hazard. So I don't quite understand this attitude. I talk to people from industry and have suggested many, many times in the last five years of going to Cal-Poly and nobody asked if they were accredited. They didn't care whether they were accredited. When you get into government they ask about accreditation. You mention this matter of equipment for instruction. That was because so many agencies in the atomic energy field perhaps are in the research business and AEC is trying to help educate, is trying to get equipment nailed down for that purpose.

ASSEMBLYMAN ANDERSON: Within our Department of Public Works in this State, they were being discriminated against.

DEAN O'BRIEN: They are not giving emphasis to the technical two year's program as well. I think they are pretty sensible in their requirements.

ASSEMBLYMAN ANDERSON: Is there any way a graduate from a non-accredited school can someway obtain this professional standing?

DEAN O'BRIEN: Well, you see in this state it makes no difference apart from registration because registration is a mark of professional standing. Anyone who pays five dollars and passes the exam can be registered. There are many students who come to us from non-accredited schools and take a Master's Degree and we have a program in engineering science especially for that type of person who work with our people in San Jose and

in a sense they get a start toward professional standing because if they say they graduated with a Master's Degree in Berkeley, that helps in registration. But the Registration Boards look at the record. New York State is different. Accredited schools count much more there. If one of our graduates wants to register in New York there is a difference, but there again experience makes up for it. The other thing is that few engineers achieve the position of responsibility such that registration makes any difference, you see. The only registered engineer in a big design office, the only one needed is the head man because he can stamp and sign all the drawings. He is responsible for the whole works.

CHAIRMAN SEDGWICK: I want to express my sincere appreciation to Mr. McCaffrey and the panel for the testimony they have given us this morning. I am sure that we got very valuable information for the committee. It seems to me when you mention engineering you take in a multitude of sins. It seems it should be regulated more as to the different types of engineering. I am particularly interested in the statement of Dean O'Brien. I think the general public is more impressed with the fact that you read in the newspaper where there are three thousand or four thousand engineers out of a job. I think that should be clarified. I think it is true there are a lot of engineers out of a job, but I also think it is true that we need engineers of a higher quality than those probably are that are out of work. And for that reason I would go along with

Dr. O'Brien on a future study and I don't think we should wait another ten years to start it. I think the sooner the better. Again I want to express my appreciation to the panel. We are certainly glad you were here and I must admit before closing that probably it was my mistake and misunderstanding in San Jose because I did get a letter at my home and I hadn't been home for two weeks when I went to the hearing.

MR. McCAFFREY: We are happy to have been here today.

CHAIRMAN SEDGWICK: Thank you very much. We will reconvene at 2:00 o'clock.

(Thereupon the noon recess was taken.)

CHAIRMAN SEDGWICK: The meeting will please come to order. I would like to offer my apology to the people here for being late in starting the meeting. But seems that your eating places here in Oakland are a little far away and it is a little difficult to get to and from. Usually we are very close to being on time. I am kind of a stickler for promptness, but we were delayed today.

Now, our first witness this afternoon is going to be Dr. Burton Vasche of the State Department of Education. Dr. Vasche.

DR. VASCHE: Mr. Chairman and members of the Committee, I appreciate very much the opportunity to listen this morning to the presentation by Vice-President McCaffrey and his associates of the University of California. I think that many

of the things said this morning re-emphasize some of the basic points presented to the Committee in San Jose several weeks ago. I will not try to duplicate anything said there, but rather to point out some of the recent developments which would be of interest to the Committee, particularly in relationship to the study which is being made and was referred to by Mr. McCaffrey earlier today. And I would anticipate during the course of this discussion that as you have questions you will note them. We also have today a number of representatives of the two state colleges who I think are primarily concerned with the problems here, San Diego and San Jose State College. I think those men may appear later on and if I can be of further help I certainly want to do that for you.

I would like to have you turn with me for just a few minutes to a document entitled, "Outline of a Study of the Engineering Agreement Between the Regents of the University of California and the State Board of Education." I am not going to go through this point by point. I think that the material was presented, at least an outline of it, at San Jose at the hearing there. It was also covered partly this morning by Mr. McCaffrey. I am not repeating the background. This document though will relate over towards the center to the present study. I would like to repeat for you at this time the general motion which was made dealing with the study which is now being made under the direction of the liaison between the Regents and the State Board of Education.

The Liaison Committee meeting on November 5, 1957, took the following action:

"Mr. Mussatti (that is James Mussatti, Executive Secretary of the State Chamber of Commerce) moved that the joint staff be instructed immediately to undertake a study of a number of items which need to be investigated before any decision can be reached, relative to the engineering agreement, and that the joint staff report back to the Liasion Committee with recommendations, if possible by the 1st of January, 1958, but not later than March 1, 1958, for action by the Committee and referral to the parent boards. The motion was seconded by President Sproul and carried."

Now pursuant to that action then, Dr. George L. Sullivan, who for many years, I think nearly 40 years, was Dean of Engineering in Santa Clara, was employed as special consultant to work on this study and he at the present time is working very hard, more than full-time, devoting all of his waking hours to this particular project.

Mr. Sullivan in addition to being Dean of Santa Clara and being a man who knows the engineering field thoroughly, served as consultant on various engineering projects throughout the country and for ten years he was a member of the California State Board for Civil and Professional Engineering. For seven of those ten years he was Vice-Chairman of the Board and it was the feeling of the Liasion Committee and the joint staff that

this man could rather effectively carry this responsibility.

Obviously many of the questions raised this morning and other questions which will be raised befor this meeting adjourns cannot be covered in the course of a brief two or three month study, but it is the feeling of the joint staff and the Liasion Committee that Mr. Sullivan will be helpful in terms of obtaining answers to a number of very basic and fundimental questions, and I would like to refer you to the document on the engineering agreement which you have in your possession over at page 9.

Now, the previous material I won't get into unless you may want to refer to it as you review it following the meeting. I think the first eight pages deal pretty much with the history and background. There is quite a bit of repetition here and I won't take time to elaborate on that.

Starting on the top of page 9, here are the kinds of things Mr. Sullivan is concerned with at the moment. He is travelling up and down the State conducting his own research preparatory to submitting to the joint staff and through the joint staff to the Liasion Committee and various steps in between the material of this kind.

"III. Comparison of the number of catalogue courses listed in engineering in the fall of 1957-58, engineering enrollment by freshmen, sophomores, juniors, seniors, and graduates, and number of full time staff in engineering with those for 1952-53 in each of the state colleges with engineering programs and the two colleges of engineering

in the university."

That is going to give a lot of information which to this point has never been pulled together.

"IV. A comparison of the engineering staffs in the state colleges and the University with respect to degrees held, teaching experience, field experience, and the number holding a professional engineer's license."

That won't be guess work like Dean O'Brien mentioned this morning as to the competence of teachers. For the first time this study will bring that information out.

"V. Examination of the current engineering programs in each of the state colleges and in the University of California to see how closely they adhere to the characteristics of each as found in the engineering agreement. Also, some analysis of the state college and university policy with respect to research grants as they relate to engineering."

I think I would like to inject here the fact that the attitude is that the state colleges are regional colleges designed to meet the needs of sections of California in which each college is located. I think by nature it is very difficult to set off one program here and pigeon-hole it in a box and say that this is one kind of engineering and another kind of engineering over here, because the kinds of jobs which colleges are being called upon to fill through trained personnel are not so categorized and I think we need to be most objective and look

at the problem in relationship to the future growth in California.

I think the state colleges have been exempted by the Legislature and the people of California as truly colleges. I am not saying basic research of a high level should be in every college. I say that is another problem, but in all probability there is more similarity in most of the problems than there is difference.

The next point is:

"VI. A study of the kinds of engineering training currently needed for industry, business and government in California and the ratio among these kinds in terms of numbers required."

I don't think I will read these statements all the way through. I think I will just call your attention to the general thought in each one.

The next one is:

"VII. A study of the actual need for graduate training in engineering with particular reference to the San Jose area and what is now being done to meet that need by Stanford University and the University of California, the two institutions offering graduate programs in engineering which are most accessible to the San Jose Area."

About a year ago I met in Orange County -- I was there for two different meetings -- with members of the State Senate and I know the same questions can be raised in Orange County as

we heard up in the County of Santa Clara a few weeks ago, and I am sure the same questions exists down in San Diego County. What further do we need to do in terms of developing an answer in terms of what this need is.

"VIII. A study of the number of new staff positions authorized (or other positions left vacant by resignations, retirement or death) in engineering in each state college and College of Engineering in the University for each of the years 1953-54, 1954-55, 1955-56, 1956-57, and 1957-58, and for each of these years how many of these positions were not filled because suitable candidates willing to accept appointment could not be found. Also the degrees held by those who did accept employment in these engineering programs during the same years."

I think you grant that is another important point of the study of engineering graduates.

"IX. A study of the engineering graduates (baccalaureate degree only) of each of the state colleges and the University for the years 1954-55, 1955-56 and 1956-57 to ascertain:

"A. The number each year who were not able to find employment which would utilize their engineering training.

"B. A distribution of those employees according to type of work, average starting pay and rate of starting pay.

"C. Such information as is available on the promotion

of those graduates employed in engineering positions.

"X. A study of transfers of state college engineering students to accredited engineering schools."

I have heard a lot of things said in general terms about the ability of students to transfer to the University, the engineering program or other programs. I have heard a lot of things as to how difficult it is. What are the facts on that? We don't want opinions. We must have facts.

"XI. A study of the changes in the current engineering programs in the state colleges required to meet present ECPD accreditation standards and whether such changes would be in harmony with the present major objectives in the state colleges, namely, 'Emphasis on production, construction operation, application, sales and service, with corresponding and appropriate curricula descriptions.'"

The next point is:

"XII. The most recent information on the total number of engineering programs in the United States and of those what percentage are accredited by ECPD."

"XIII. Has the ECPD given consideration to a kind of accreditation which would recognize the objectives of engineering in the California state colleges which is in keeping with the differentiation of function concept underlying the tripartite system of public higher education in California. If not, what is the likelihood of that occurring? In general what modifications of the

present standards would be required if this were done?

"XIV. Some appraisal of the current and future need for engineers in relation to estimated supply both in California and in the nation."

I think that is a very significant point. And then Mr. Sullivan's report will present:

"XV. Summary of the report on engineering, if one is issued, of the Subcommittee on Higher Education of the Assembly's Interim Committee on Education."

In other words, a recommendation which this Committee will make should be part of the report which we feel Mr. Sullivan is going to make and then finally the report will include summary of findings, conclusions, and recommendations.

Dr. Sullivan is working in the field. He was in San Diego the other day, I understand. He is getting around various other parts of the State and as far as we know he has been thoroughly acceptable to all parties in relationship to this study. We feel this at least will be a beginning in pulling together the facts and data which you need, which the policy-making board needs in order to move ahead on their programs. I think, Mr. Chairman, that gives rather generally the status of the study. Now, obviously, the bigness of the study, the complex questions here, the thing could not be wrapped up between Thanksgiving and New Years. Mr. Sullivan is working very hard to have his work completed by March in order that the Board may be able to plan for the next year, and if there are any

other indications, legislation or budget-wise, to present that to you in the budget session.

CHAIRMAN SEDGWICK: Do you expect to have the report by March 1 or March 30?

DR. VASCHE: I think that was the statement I believe conveyed to you in all probability through Seman's of our office and he was speaking in terms of a reproduction and all that kind of thing. I think we will try very hard to beat the dead-line given to us by our own board. In other words, if the core of the material is ready -- it is being pulled together as fast as Mr. Sullivan is able to work, and then I think in the case of some of the restudy material that will go to the Legislature before it actually goes to the board for final approval. I think for informational purposes that is all right.

CHAIRMAN SEDGWICK: Any questions anyone has to ask?

ASSEMBLYMAN HANNA: I have a couple. In reference to the agreement that are talking about here, Dr. Vasche, is it clear in your mind as to just who the parties were that entered into this agreement? If it is would you tell us exactly who the parties to this agreement were?

DR. VASCHE: Well, do you mean by "parties" individuals or do you mean bodies?

ASSEMBLYMAN HANNA: What principals were represented?

DR. VASCHE: Well, I think engineering has a long history. The state colleges offered no engineering until the programs were pioneered at Cal-Poly. That was the early part of the War,

about 1940. The engineering programs in other institutions came at subsequent dates, that is in terms of any organized engineering. Engineering at the state colleges was not actually pulled together in any organized form until this agreement was signed. Courses were offered but the programs were in early stages. The engineering agreement resulted from a series of studies. I think one was back about 1947 or 1949 in order to give to the Legislature and the state government a picture of what the engineering program was to be in the state colleges. There was need to look at the total engineering offered in the universities as well as the state colleges and a committee was set up at that time which worked on the problem. It was not able to develop any type of organized program.

From there then the Regents and the State Board of Education through the Liasion Committee set up a study of engineering education. Mr. Potter from Purdue University who was mentioned earlier today, came out and headed one study. A state college study was made and they went out in the field and on to every state college campus and worked with the local faculties, with the president of each institution and two reports came out. Then those reports were considered by the Liasion Committee and then directed back as Dean O'Brien said this morning, the Liasion Committee directed the joint staff to try to pull together in an organized form a statement that would summarize and provide a framework for the engineering agreement. That went through the process and came out as a document.

Before that came out, however, that was a subject of discussion by the state college presidents' group. They were very close to this development. A committee from the state colleges, including Ralph Smith of San Jose, Harold Hayes and one or two others worked with a group from the University in terms of drafting that agreement. And the agreement then went through the technical advisory committee where the differences were reconciled and went to the Liaison Committee where it was approved by both bodies and subsequently approved by the Board of Regents and the State Board of Education.

ASSEMBLYMAN HANNA: The agreement is tacitly between the state colleges and the universities, correct?

DR. VASCHE: Yes, in fact the Liasion Committee has no standing under the law. It is a relationship between Dr. Sproul and the State Board of Education.

ASSEMBLYMAN HANNA: Then, if there was any agreement between these two bodies it would have to be between Dr. Simpson and the State Board and Dr. Sproul and the Regents, is that right?

DR. VASCHE: That is right, sir.

ASSEMBLYMAN HANNA: Now, is there any question in your mind about the legal status of these parties to enter into this type of agreement?

DR. VASCHE: I don't think there is any question about legal status. This went through the same process that the bodies have been operating under for many years as authorized by the

Legislature. I think it is an attempt to pull together the major interest groups and the major points of view to present to the Legislature, particularly in terms of financing a realistic program. I think the idea originally in setting up the three-sided system of higher education was to eliminate duplication of services and effort where the University would have certain functions, the state colleges certain functions, and the junior colleges certain functions, those functions not to be in duplication, one to supplement and enrich the other.

ASSEMBLYMAN HANNA: Did the state colleges all approve the agreement?

DR. VASCHE: The engineering agreement was accepted by the presidents of the state colleges as a group. The feeling was for the first time it was a statement which recognized engineering as a function of state colleges and it set up a framework through which the engineering program could be developed.

ASSEMBLYMAN HANNA: Your answer to my question is yes?

DR. VASCHE: My answer would be a most emphatic yes.

ASSEMBLYMAN HANNA: Who had the responsibility of enforcing the agreement?

DR. VASCHE: Well, the development of the agreement brought approval by the board, State Board of Education. Responsibility for enforcing the agreement rests within the chief administrator who in turn delegates that responsibility to the people who are responsible to him, the Division of State Colleges, in which I

happen to be the chief and in turn the president of each college has major responsibility. The president of the college is responsible for the conduct of his educational program within a broad policy set down by the board.

ASSEMBLYMAN HANNA: Was it correct then to say that under Mr. Simpson that you had central authority for the enforcement of the agreement?

DR. VASCHE: I don't like to use that term "central authority". We like to work in a position of cooperation and from our level be in a position to service and give leadership and assistance to the college president and his staff who are responsible for developing the program of the college and in turn requesting approval by the board on changes or upon accreditation or not accreditation, but approval of the proposed new terms.

ASSEMBLYMAN HANNA: Do I get it right that you prefer not to have the central authority but rather --

DR. VASCHE: I am saying the authority does rest within the Division of State Colleges. I think the question comes up as to what you mean by authority. If you mean it in the sense of narrow control, we do not operate on that basis. We operate on the basis of the president of the college, the local administrator, being responsible for his regional college.

ASSEMBLYMAN HANNA: I was thinking about control and responsibility.

DR. VASCHE: We do not exercise narrow control. We try

hard to have the State Board of Education be a policy board with the policies developed in large part from the people actually in the operating level and then as a policy comes up it is recommended to the director who in turn presents it to the State Board of Education. And since I think the agreement was signed, I believe four or five state colleges have been given authority to develop programs in engineering. In the case of Long Beach, for example, the feeling of the committee at Long Beach there was that there was need for engineering. Engineering had not been planned for this Long Beach State College. About a year ago the proposed program in the Long Beach State College was submitted to the State Board of Education with supporting data. The State Board of Education authorized the development of an engineering program in the Long Beach State College. In the development the Board set the policy upon the request of the local college. Now, the college has the responsibility then of going back and developing the program in a manner consistent with general policy of the state colleges. We in Sacramento don't --

ASSEMBLYMAN HANNA: Has the development of the engineering program in those colleges which have engineering programs to your knowledge followed the agreement?

DR. VASCHE: I would say generally that the programs have been developed in line with the agreement. Now, I think that you need to interpret the agreement. Mr. O'Brien gave his interpretation to it. I think it is true we have had a problem

in our institution of staffing our programs in this and several other fields by people who had not just the professional training but likewise have had a wide variety of professional experience, that is field experience.

ASSEMBLYMAN HANNA: Does the Department have an interpretation of the agreement?

DR. VASCHE: Yes, the Department would have a very definite interpretation. Our state colleges are regional colleges and they are responsible for training men and women to serve within the geographic region in which the college is located.

ASSEMBLYMAN HANNA: That interpretation has been passed down from the main office to the college?

DR. VASCHE: That is a very sacred principle. And in addition I think in this field there is one area which I think again is very clear and that is that basic research -- I am talking about fundimental research, large-scale research is very clearly a function of one or two centers in California. You can't expect to build major research centers for engineering or any other field in every institution. I think it is in that field that the University -- field of medicine, field of law, including engineering -- I think the University of California is the key research institution and I am talking about high-level research, not just a project that maybe some people might call something else.

ASSEMBLYMAN HANNA: Under your interpretation of the agreement do you think that the colleges at this time could

seek accreditation from ECPD?

DR. VASCHE: If you are to ask me about accreditation in my field I would be able to answer your question emphatically. This field is a highly technical field. I have heard conflicting testimony from within our state college family. Some of the people have told me an institution may not seek accreditation unless it has a research program. The only way to find out is to have one or two institutions apply for it and see what happens.

ASSEMBLYMAN HANNA: Under your interpretation do you think these local state colleges should give advanced degrees?

DR. VASCHE: Advanced degrees? We do offer Master's Degrees in applied fields. We do not offer Doctor's Degrees in any fields. I think there is a question whether we are qualified to offer degrees in very many fields above the Master's Degree level.

ASSEMBLYMAN HANNA: Would such an offer be consistent with your interpretation of the agreement?

DR. VASCHE: I would say within the field again that you must steer away from the upper research level. When you talk about research in any science you are talking about a program leading to a Ph.D. in a basic research area. I don't think our programs are designed -- California can't afford to have many institutions with the costly equipment. I think if you are talking about a Master's Degree in a field which is designed for a level of position which in a sense is terminal as far as advanced training is concerned, then I think the state

colleges, some state colleges may be qualified by staff. They could be qualified by facilities with very little additional planning.

ASSEMBLYMAN HANNA: May I ask one more question on your interpretation? In the limitations you have just stated, do you think the quality of the programs offered and the degrees such as might be offered should be any different under state colleges than they would be under the University?

DR. VASCHE: I am not sure I have your question. I don't know whether I understand just exactly what you want answered.

ASSEMBLYMAN HANNA: To the degree that you have stated that these colleges -- I believe you said they should be regional colleges and serve the needs of the particular region?

DR. VASCHE: That is right.

ASSEMBLYMAN HANNA: To the degree that they do that, do you think that they should have the same quality as a similar program being given on a university level?

DR. VASCHE: If you mean in the sense of being programs that are well planned, well taught, that are practical, that are designed to meet the jobs for which the graduates are entering, I think the same quality -- I think we are all talking about high-quality programs. I think certainly every program we offer in the state college, every program I know about, we feel is a high-quality program. I think it should be continued. I would take very decided exception to the statement made this morning by Mr. McCaffrey. We are receiving -- I think there is a tendency

in California in many parts of the State for students to attend the college in the area in which they live. San Diego State College is certainly drawing some outstanding students thoroughly qualified for the kind of engineering they are giving at the University at Berkeley or Stanford or anywhere else. I get a little concerned when you raise the question of quality. You are implying the state college programs are not quality programs. We feel in many regards they are superior to that being given in other institutions.

ASSEMBLYMAN HANNA: Thank you.

ASSEMBLYMAN CRAWFORD: Dr. Vasche, I gather by the answers that you gave to Mr. Hanna, that you feel that if there is a demand by a particular locality and the citizens and the industry in that locality request a certain type of training that should be offered by that state college located in that area?

DR. VASCHE: I think as a general principle that that would be sound. I think the exception is that you would have to qualify in the sense of the kind of equipment, material, and special factors and that kind of thing. If you are talking about advanced level research in engineering, that is what you have in mind I think, that becomes a matter of judging whether that is within the relm of the state college qualifications of staff and faculty and all of that kind of thing.

ASSEMBLYMAN CRAWFORD: Well, Dr. Vasche, I believe you are familiar with the fact that interested citizens in San Diego County have offered to purchase, I believe it is an atomic

reactor which would only require the State to provide a suitable structure of comparatively low cost. Further because of the interest of the industry in this area there is a constant demand for engineering graduates and there is ready placement for all that any local institution could graduate. Now, in addition to this I gather from the testimony that we have heard here today and also at San Jose that there is no strenuous objection to permitting the state colleges to seek ECPD accreditation other than perhaps by a few isolated individuals in administrative positions?

DR. VASCHE: I think the answer to your question appears in the last page of the engineering agreement which says, "In carrying out their objective, state college engineering programs are not designed to come within the scope of present ECPD accreditation standards." That is what the agreement says.

ASSEMBLYMAN CRAWFORD: I believe that even those who opposed perhaps the state college seeking ECPD accreditation will agree that conditions have changed since 1953, at least that is the general tenor of the testimony that has been given in the last two meetings. Therefore, taking all of this into consideration, do you feel that there is any real objection to repudiating the 1953 agreement and permitting state colleges to seek ECPD accreditation?

DR. VASCHE: I think Mr. Mussatti upon making the motion asking for this study to be made, certainly raised a very positive question in the minds of the State Board of Education

as to the soundness of this practice. And the purpose of Mr. Sullivan's study is to pull together the factual information upon which that decision may finally be made. It does seem to me there has been a definite change of attitude and I don't want to second guess what the final result will be, but you will know that when you come back in March in the legislative session.

ASSEMBLYMAN CRAWFORD: Well, I don't like to second guess any opinions either. However, in talking to various individuals throughout the State including a couple of Regents, it would seem to me they are in favor of removing this restriction and permitting state colleges to be accredited. However, I do have one fear in talking to the same individuals who have been interviewed by the Dean who is making this study and that is the opinion expressed by many leaders in industry that the Dean apparently has a report well in mind and is merely seeking information to substantiate this, and that it is their opinion that there will be permission to permit the state colleges to seek ECPD approval, but very definite veto of any effort to permit certain state colleges in certain localities to have a master of science in a particular applied field which is necessary in their area. I merely pass this comment on in the hopes that it will be of benefit and to forestall any possible future criticism that might arise over the result.

DR. VASCHE: I think that the Legislature each year has the responsibility of reviewing rather carefully the budget of the University and the state colleges. Certainly there is great

emphasis on science, mathematics and engineering. We are going to be paying particular attention, as are the respective boards and institutions. I think the attention that you are giving to it and that countless other people are giving to it will bring forth much good.

ASSEMBLYMAN CRAWFORD: One last question. In your opinion if this report is favorable, you believe it will be necessary that legislation be passed or will it be sufficient for these various groups to agree to a change in policy?

DR. VASCHE: I don't think you need to have legislation, although I would not want to have that be a final and definitive answer. I think we want to review that with the attorneys and the legislative counsel. It seems to me that much of it could be handled through the operative policies. Whenever we come up with a new program we must come to you in the Legislature and present it and have it defined. I think if there is need for additional engineering facilities, I think that will be presented to you at the proper time.

ASSEMBLYMAN CRAWFORD: Thank you.

ASSEMBLYMAN HEGLAND: This atomic reactor that Mr. Crawford referred to, does the State Department or does the State Department not plan to energetically present and energetically support a proposal that the San Diego College be permitted to accept atomic reactors?

DR. VASCHE: That is a very good question. You have a document that gives all the background and our policy on that.

You have an eleven-page statement that we have worked on since the San Jose meeting and the State Board of Education at its meeting in Los Angeles formally adopted a policy in this regard and I think the request of the San Diego State College -- this was adopted working very closely with the President and his people. This has the full approval of the President. He was in the room when the board took action on it. We certainly very vigorously are supporting the college receiving the reactor.

ASSEMBLYMAN HEGLAND: Your answer is yes?

DR. VASCHE: Yes.

ASSEMBLYMAN HEGLAND: The State Department or Board of Education is in favor of San Diego accepting the atomic reactor?

DR. VASCHE: Our policy on this again is a highly controversial field in science and engineering. If for example, your community offers -- if your college has made application for that, it will have full support.

ASSEMBLYMAN HEGLAND: Do you feel that this is in harmony with the 1953 agreement, your current position on the accepting of the atomic reactor?

DR. VASCHE: Well, in so far as this is a field that provides experience in the use of that equipment and which is desirable, and that becomes a part of the program, then the board will support it. Mr. Robinson is here today and is prepared to discuss the details with you that this reactor would fit into that program.

ASSEMBLYMAN HEGLAND: Well, does the State Department plan

energetically to support a request if it is made from the engineering faculties of San Diego State College and San Jose State College from each area, do you plan to support a proposal that these faculties offer the Master of Science Degree in engineering?

DR. VASCHE: I can't give you the answer to that because I frankly don't know. We do offer at the San Diego State College a Master of Science Degree in applied physics.

ASSEMBLYMAN HEGLAND: Does the department -- it would have to be either yes or no, or we have no position. Do you have a position on the granting of an M.S. Degree in engineering at San Jose and Fresno and San Diego?

DR. VASCHE: The answer is tied up in the result of the study which is going on at the present time. If there is a recommendation that there is need in industry for people trained on this level, then the answer I would assume would have a fair chance of being yes.

CHAIRMAN HEGLAND: Up to now there is no position?

DR. VASCHE: Up to now the programs are not offered at this point.

ASSEMBLYMAN HEGLAND: My last question. Do you feel that in line with the 1953 agreement that both Cal-Poly on one hand with their engineering program, their so-called up-side-down program, and on the other hand Fresno and/or San Diego and/or San Jose that both have these programs are equally, as now constituted, within the context, the spirit and the words of

the 1953 program, or is one of the two programs more in the spirit than the other, or is one of the programs totally outside the spirit?

DR. VASCHE: Well, I think that is an almost impossible question to answer. I think the Cal-Poly program has been referred to and the agreement does not specify that the programs shall all be Cal-Poly programs. The Cal-Poly program has an approach and procedure of sequence. It also requires more units than the other programs. I think our people all have tried very hard to live within the responsibility of being regional colleges and keeping up with the growing demands of the technology and so forth, and have had to make adaptations. I think the answer to be realistic, the relationship the state colleges have to the University in two or three regions of the State where they are close together, they have to get together and agree as to who is going to do what. I think that is very clear. To duplicate the program is not to the State's interest.

CHAIRMAN SEDGWICK: Assemblyman Anderson.

ASSEMBLYMAN ANDERSON: I have a couple of questions which I would like to ask. Shortly after the San Jose hearings I had discussion with Dr. Simpson about this 1953 agreement and I got the impression quite emphatically from him that he was looking upon this agreement as something that needed some overhauling, some revision, and that very likely in the near future the policy of the Department of Education would be to permit each college as it desired to seek ECPD accreditation and

to go into the study of their own graduate program for Master's Degree in engineering. And yet I have heard rumors also, as was indicated by Assemblyman Crawford a moment ago, that this current study by Dr. Sullivan was of such a nature that probably they will go into permitting this seeking of ECPD accreditation, but the answer is no at this time on graduate study. Could you enlighten me on that?

DR. VASCHE: I think the procedure of Dr. Sullivan's study will be brought to the joint staff. The joint staff sits down with the technical advisory committee. President Love of San Diego is a member of that committee. There are three University people on it, four people, and then the Department of Education. Their job is to go through and process -- we will want to confer with our people. If we have reactions from the field consistent with what you two gentlemen have said today that will evaluate the report in that light, then it will go to the Liasion Committee for action and then to the two boards. People may be unduly concerned. If the study is not objective, then I think the study must be evaluated on that basis at the present time.

ASSEMBLYMAN ANDERSON: Who is paying for Dr. Sullivan's work?

DR. VASCHE: Dr. Sullivan is in the position -- we have in our set up a position of special higher education which is vacant pending the appointment of a person on a permanent basis. We took that position and employed him on a two or three month's basis, so he is actually being employed in the Department of

Education. They are carrying the responsibility for the study.

ASSEMBLYMAN ANDERSON: Who represents the Department of Education or the Board of Education on this Liasion Committee?

DR. VASCHE: Well, at the present time -- Dr. Semans did represent the Department for about five years. However, he has been given a new assignment and the Personnel Board is now in the process of setting up an examination to be held for a new list. It is a civil service position. The body that actually decides on the recommendations however, is the Liasion Committee itself and that includes four Regents, four members of the Board, President Sproul and Dr. Simpson.

ASSEMBLYMAN HANNA: May I ask one additional question on that same point?

ASSEMBLYMAN ANDERSON: I had one comment to make about the item that appeared in last Friday's issue of the Sacramento News Letter which was referring to the budget of San Jose and San Diego State Colleges with regard to these atomic reactors we have been discussing, and it indicates here reference to this new policy of the State Board of Education, that you also mentioned in here. Now at San Jose we heard reference to the requirement of San Diego particularly that to secure a grant of this type from the AEC that it would be necessary for that engineering department to have accreditation. Does that still hold true?

DR. VASCHE: I can't give you the answer to that but Mr. Simpson did write a letter about a week and a half or two weeks

ago on the matter of state college engineering programs, that report having come to us and we asked the Director to send such a letter to Mr. Strauss. We are cognizant there has been an issue in some instances and if this problem exists, then we certainly must work to clarify it.

ASSEMBLYMAN ANDERSON: If they insist on ECPD accreditation --

DR. VASCHE: That becomes another issue. I mean it points up and gives another reason in support of accreditation of all engineering programs by ECPD.

ASSEMBLYMAN ANDERSON: But you still wouldn't be able to say on the basis of that that San Diego could go ahead and seek it?

DR. VASCHE: Well, I think that the studies are moving along here -- the Board has a study underway. We are going to be able to answer these questions when the study comes in.

ASSEMBLYMAN ANDERSON: You indicated it would only take an administrative order to change the policy as far as the Board is concerned.

DR. VASCHE: The Liasion Committee has no standing under law. The State Board of Education, the Regents, to be realistic in terms of submitting bills have tried to be in agreement in terms of expansion programs or changes in programs that represent significant items to the Legislature. And that is the only reason we have the machinery. The Board could go on by itself and it could take a lot of actions and the Regents could do

likewise, but instead of having a complex --

ASSEMBLYMAN ANDERSON: But it is also the policy of the Board not to grant this administrative change of policy unless the Liaison Committee recommends it?

DR. VASCHE: I think the Board feels -- this represents a long process. There has been a lot of understanding, a lot of support for programs both in colleges and universities, and at this point to suddenly say we are going to ignore our agreement with the Regents, we are going off by ourselves -- they don't want to do that until they have the facts. That is why it has been referred back for this study.

ASSEMBLYMAN ANDERSON: That is all, Mr. Chairman.

ASSEMBLYMAN CRAWFORD: San Diego State College was refused a grant from the AEC because it was not accredited. The present offer is for private industry to defray the cost of an atomic reactor for San Diego State College which would not require the ECPD accreditation.

ASSEMBLYMAN HANNA: On any of these study groups or recommending groups that have been involved in this problem on a State level, have you ever had any representation from an engineering department from any state college having such a department?

DR. VASCHE: Yes, the state colleges, in the original agreement, Fresno State College, Cal-Poly, San Jose and all of the state colleges participated actively in drafting the reports. Also we had a standing committee of the state college and university and junior colleges working jointly in terms of the problems

involved in this thing.

ASSEMBLYMAN HANNA: Any of these people represented on the present study?

DR. VASCHE: On the present study, Mr. Sullivan is brought in as consultant. He is going out into the institutions. He was in San Diego and met with the faculty. He is going around to each of the colleges on that basis.

ASSEMBLYMAN HANNA: The recommendation will come directly from him and not be the recommendation of the department heads per se?

DR. VASCHE: They come in and go through the technical advisory group. We have President Love on that representing the state college presidents and he in turn confers with his associates.

ASSEMBLYMAN HANNA: That is what I want to distinguish. The state college president does have a representative and the engineering department per se do not?

DR. VASCHE: The engineering departments work through and with the presidents. I would like to make just one additional point. The Director of Education, I think our own Board, in recognizing the complex problem of mathematics, science and engineering, have set up a conference to be held on February 24 and 25 in Sacramento to which will be invited 200 key people, presidents of major corporations in California, and various other people, such as leading laymen, parent-teacher groups, so there will be a cross section of the State's leading citizens. Dr. Simpson has been in touch with the Secretary of Defense. We want

to get the best help we can in terms of the Nation's general trend in the field here and try to analyze what we are doing in the public schools and junior colleges, state colleges, and private institutions in the field of mathematics, science, and in terms of science and mathematics teachers. We anticipate from that meeting will come some good guide lines which will help us further in terms of making realistic decisions in this total field. I think that is another development -- I don't know of another state in the Union that has done that.

CHAIRMAN SEDGWICK: What were the dates of that meeting?

DR. VASCHE: February 24 and 25 in Sacramento.

CHAIRMAN SEDGWICK: If there are no other questions I want to thank Dr. Vasche for his testimony. I am going to deviate just a little from our agenda at this time. We have a gentleman in our group that would like to testify and he can't be here too long, Joseph R. Decker, of the Engineering Societies Personnel Service. Mr. Decker.

MR. DECKER: Thank you, Mr. Chairman. I listened with a great deal of interest this morning to the statement from various persons in the educational field. My name is Joseph R. Decker, 57 Post Street, San Francisco, California.

It appears that most of the discussion has to do with accreditation. Of course the Engineering Societies Personnel Service is the employment arm for the National Engineering Society, which doesn't enter into that picture. It might be pertinent to indicate that information which comes to us from

employers in describing the kind of person they want, job specification or job order, if you will, never contains or includes the term "accreditation". The employer might say, "From a recognized school" and pretty much leave it up to us to determine what is a recognized school.

I haven't found except in educational circles or in some of the professional circles that the term "accreditation" is encountered. That more or less fills in with Dean O'Brien's statement that this matter of accreditation is more or less something that has to do with the teaching profession and that people who call us and ask for information regarding accredited schools, we have a list of those that are accredited by ECPD. They never ask for an accredited school. They ask, is it a good school, is it a recognized school, and quite obviously the general public doesn't know very much about this term "accreditation."

They think of a school as being accredited, whereas it is a course which is being accredited. The Engineering Societies Personnel Service is conducted by the Four Founders Societies and has been for forty years, and is now carried on in cooperation with six other engineering groups. They originated shortly after World War I because the societies had a problem in placing or finding employment for engineering members who found on returning from service it difficult to secure employment. This combination known as the Engineering Societies Personnel Service today is an outgrowth of the individual efforts of the

various societies. While employment hasn't been an established thing in the societies from the time of their inception, it has been something that engineers when they are associated in society groups do for one another. So for say around five years the civils have struggled with the matter of their employment of their engineers, and mechanicals for something over seventy-five years, and down the line. It was only when shortly after World War I it was discovered there was a duplication of effort within the same building, 2939 West 3rd Street. For example the electricals had one person wearing a cap as being employment person, and the mechanicals had one, the civils had one, and mining and metallurgical and chemicals had one, so they combined and put together an employment activity. It was conducted for many years for members only and the societies paid the bills.

It was a sort of contribution sort of affair, but along about the middle 30's we move into the societies becoming quite tight and the societies began to count their fingers and toes and found out they had spent a substantial amount of money on employment. They set up a joint committee to deal with the matter and after about two years it was decided that employment activities would be combined under an Engineering Societies Personnel Service and that a Board of Directors made up of the national secretaries of the Four Founders Societies would direct the activities. By "direct" I mean they set up broad policy and within the limits of that policy why the employment activities are carried on.

The New York activity attracted favorable attention and during the early days and subsequently thereafter moved to Chicago and San Francisco and Detroit, so now there are those four offices. Our business is to accept from employers on the one hand a stipulation as to what they want as an engineer, and on the other hand to accept the registration of engineers as to what they are qualified to do and through a classification method to try to match these things up to a point where we can refer the individual engineer to an employer for a job position. Where mutual agreement is encountered when the two are brought together then the problem of employment is resolved by the employer and the employee.

In the past two or three years we have furnished a great deal of information to the public and technical press concerning the employment of engineers and more recently we have furnished some information to the San Francisco Examiner. So we give them the information which is regularly reported on and it results in a newspaper article which seems to have attracted a substantial amount of attention.

Subsequent events have indicated that that newspaper article, to paraphrase an old, old saying, "As it was told and retold it grew and grew and grew," and just in this room why I have had occasion to observe that. The statement as originally published said there were one thousand applicants, engineer applicants registered with our office. The statement made in some of the subsequent stories is that there were one-thousand

unemployed engineers. The Chairman in remarking about it threw three or four thousand engineers into that picture. A friend of mine in Los Angeles called me and said there was an article in the newspaper said there were thousands of unemployed engineers in this area. The fact remains that I was quite concerned in giving my statement regarding the number of applications in our file. When some question as to the validity of that statement arose why I had to take time off and count them and there were closer to thirteen-hundred applicants in the file than there were to a thousand and the statement that the job situation had declined precipitously is indicated on the regular charting that we make. We are a society of service. We report to everybody and his brother and it is like living in a goldfish bowl and in order to make this thing rather clear to business men who like to know something about our operations, we prepare charts.

An observation of those charts will reveal that the jobs have dropped off substantially in the past year and a half. Likewise, the number of engineers who are seeking jobs have increased substantially in the last year or year and a half.

CHAIRMAN SEDGWICK: Any questions?

ASSEMBLYMAN CRAWFORD: Mr. Decker, are you trying to tell us that the Engineers Council for Professional Development is primarily an employment agency?

MR. DECKER: ECPD?

ASSEMBLYMAN CRAWFORD: Yes.

MR. DECKER: Oh, no.

ASSEMBLYMAN CRAWFORD: Are you any branch of it?

MR. DECKER: Not at all. ECPD enjoys the same position with regard to the Founders Societies as do we. It is a joint cooperative effort among a number of engineering societies to provide in the case of ECPD for information concerning the accreditation of certain college courses. In our case it is a joint cooperative effort among the several societies to provide employment service.

ASSEMBLYMAN CRAWFORD: Now, you have said there are approximately thirteen-hundred engineers registered with you. Now, are these engineers unemployed at the present time?

MR. DECKER: I took a spot check to determine that. I would actually have to read each card and determine whether they were employed or not at the time that they registered. In the newspaper article I pointed out it is almost impossible to say whether they are working today or they are not working today. But in this spot check, and I think it was a valid sampling, it indicates between 60 per cent and 70 per cent were unemployed at the time they registered with us.

ASSEMBLYMAN CRAWFORD: How can you explain the fact that the Division or Department of Architecture in the State of California has advertised widely throughout the State, seeking to obtain the employment of architects and also structural engineers in order to open up offices in San Diego, and they have not received any replies that were qualified?

MR. DECKER: Well, I can't account for it except that we rarely receive job orders from State activities. We receive job announcements but under the law we are not privileged to enter a job order and do any work on it, make any referrals unless we actually have a request from a particular activity.

ASSEMBLYMAN CRAWFORD: The point I'm trying to establish is the fact that here we are trying to hire two or three men at the most in the State of California and yet apparently there are so few men unemployed that are qualified that it is impossible to fill these positions, and yet you tell us here today there are approximately 70 per cent of thirteen-hundred who are unemployed. To me the figures are just unreconcilable.

MR. DECKER: Well, I think it is probable reasonable to reach that conclusion because when we talk about engineers we talk about people who do a great many things. In our classification and system alone we have one-hundred numbers for classifications and probably two-hundred occupational classifications on one side of the ledger and about two-hundred occupational classifications or one-hundred numbers on the other side. Well now if you would extend that, you have one-hundred occupations and one-hundred industries which these occupations could use, so you could run into ten-thousand things, an engineer could. I don't think that we have a large number of architects in our file, but we have some. We are not privileged to tell an architect to go up and see the Chief of the Bureau of Architecture unless the Chief requests it. The same thing applies to these

other industries. Some of the missile people immediately picked up the telephone and said, "Well, send a thousand engineers down to us." The fact that we have a thousand engineers doesn't necessarily imply they are all missile engineers or architects.

ASSEMBLYMAN CRAWFORD: I believe from the gist of your statement that accreditation is not important?

MR. DECKER: We don't encounter it regularly and frequently as far as the employer is concerned. I have never heard him say he wants it.

ASSEMBLYMAN CRAWFORD: Then accreditation is not important in the State of California?

MR. DECKER: It appears not to be important to the employer of engineers.

ASSEMBLYMAN CRAWFORD: Can you explain why there would be, appear to be reluctance on the part of the Regents of California to agree to permit state colleges to seek accreditation?

MR. DECKER: Not at all. I am not informed on that at all.

ASSEMBLYMAN CRAWFORD: Thank you.

ASSEMBLYMAN HANNA: From your experience, Mr. Decker, in the employment end of this engineering business would you say that the State of California at the present time is doing as good a job as it can do in meeting the engineering needs in all kinds of industry in the State of California?

MR. DECKER: You mean the State Employment Service?

ASSEMBLYMAN HANNA: State colleges and universities?

MR. DECKER: Oh, yes.

ASSEMBLYMAN HANNA: There has been a general wide acceptance of the graduates and I presume that you handle graduates both of the state colleges and of the universities?

MR. DECKER: Yes.

ASSEMBLYMAN HANNA: And has there been any distinctions in the choice by the employer in those two?

MR. DECKER: None at all.

ASSEMBLYMAN HANNA: Thank you.

MR. DECKER: We haven't encountered any such distinction.

CHAIRMAN SEDGWICK: If there are no other questions I want to thank Dr. Decker for his testimony. Thank you very much.

MR. DECKER: Thank you very much.

CHAIRMAN SEDGWICK: Now the next person that I am going to call on is Paul W. Little, Chief of the Employment Service. He has been asked to testify because we are anxious to know the needs for engineers today and unemployment among engineers.

MR. LITTLE: Mr. Chairman, if I may I would like to make a brief summary statement to the Committee and then devote whatever time you wish to devote in answering to the best of my ability such questions as you may want to ask in this area.

My statement will try to follow your agenda as to the need and number of unemployed engineers and the long-range view.

As to the need or demand for engineers in California, yesterday, as of January 21, we had job openings in engineering

classifications for 596 engineers. Now, the breakdown in the engineering field, I have given the broad engineering classifications. We had job openings for 1 metallurgical, 34 chemical, 158 civil, 159 electrical, 56 industrial, 186 mechanical, and 2 mining. Now of these openings, 596 openings, 429 or 72 per cent required degrees of Bachelor of Science or higher. The remaining openings called for various arrangements to substitute work experience for college training.

Now, about 55 per cent of the openings which we had on hand yesterday specified, "male preferred," but in general if qualified it is our experience that if qualified women engineers are available these requirements in many cases can be waived. Now, this survey of demand for engineers, Mr. Chairman, was made by telegram, teletype yesterday so that your Committee would have as current information as it was possible for us to give you and that is the reason that I did not have a mimeographed copy prepared because these wires did not come in until yesterday noon and I did not have a chance to mimeograph this statement.

Now, we included in our survey only those offices which have a heaviest demand in our system of employment offices throughout the State for professional and engineering orders. I would say that this demand in the remaining offices that we did not survey that there was an additional demand for between 50 and 75 engineers, so that it would be safe to say that the total demand in our offices yesterday throughout California was in excess of 650 engineers in the classifications I mentioned.

Now, industrially this demand for engineers came from missile and air craft establishments, came from government air bases and ship yards, from federal, State and local government components and a scattering of establishments in the transportation, utilities, communications, machine tool and chemical industries. This demand for engineers is about one-half less, about 50 per cent less than it was a year ago in January of 1957. Now, I thought the Committee might be interested also in the national picture so that you can compare it with this California demand I have just given you.

Now, I reviewed the report we get from the other states throughout the nation as to demand for engineers. In November and December report, which openings are now current, there was a demand throughout the nation for 2,006 engineers and the breakdown was as follows: 56 metallurgical, 184 chemical, 290 civil, 609 electrical, 118 industrial, 573 mechanical, and 168 aeronautical. In addition to these openings from other states, there were openings for 111 chemists, and 380 draftsmen, and I might say, Mr. Chairman, that I was in telephonic communication with a neighboring state of ours yesterday afternoon and they are now processing an order for 500 engineers to be submitted nationally this week. Therefore, that development and a number of others which we know about but which have not yet been officially processed, would indicate that this figure of 2,006 for the nation as a whole is very conservative as of yesterday.

Now, as for the long-range view of the need for engineers in California, we of course in the Department of Employment cannot predict this with accuracy due to the fact that there are some very important unknowns in this picture. The need for engineers has been discussed this morning on a number of occasions and it depends on two major factors. One is the economic climate and the second of course are the plans of the government for defense spending, influencing the field of research and development.

But within these qualifications and certainly not appearing to be experts in the crystal-ball gazing business, I would like to comment, Mr. Chairman, on some trends which appear to be reasonably sound in looking to the future in the engineering field in California. Now, first of all, it is reliably estimated that California's population will increase in the ten-year period 1955-65 by 37 per cent. We should have 18 million people in California by 1965. Now in this same ten-year period it is reliably estimated that our employment will increase from 5,494,000 to 7,320,000, or an increase to employment of 33 per cent.

In 1950 the census in California indicated that engineers constituted about 1.3 per cent of our total employment in California. In 1955 most of the authorities that we could check with verified that this per cent had increased to 1.5 per cent and it is estimated by the United States Department of Labor in their national trends that engineering nationally will constitute about 2 per cent of employment, total employment in

1965. Now, we do know one thing that the engineering profession has grown much more rapidly as the percentage of total employment in California than it has in the nation as a whole. So that by applying the national standard to California, we feel this is somewhat conservative.

Now, putting those in terms of figures we could have in California by 1965 about 145,000 or 146,000. Now, this would be an increase in this ten-year period of about 63,000 and we know from experience that the replacement need of engineers annually is about 1.4 per cent and that would add another 11,000 in the ten-year period so then our need could be -- it could be reasonable to assume that our need could be over 70,000 or closer to 75,000 in the ten-year period 1955-1965 for engineering in the classifications I have mentioned. Now, I am prepared, Mr. Chairman, to comment on the long-range trends on the various classifications and I have brought quite detailed documentation of that with me but I do feel that would take a considerable amount of time.

I am very willing to do it, but I would like to go into the labor supply side of my report and then if you want to come back and have me describe some of the employment outlook facts concerning the individual classifications, I would be very glad to do so. I would like to say that I am prepared to turn over to the Committee detailed statements on the employment outlook for the major scientists classifications and all of the major engineering classifications. We have done a considerable amount

of research on that in the Department of Employment and have documented it and we are able to turn that over to the Committee. So with your permission I would like to make a few brief comments on the labor supply side if I may, as to labor supply and gain in order to give you as current information as we possibly could. We surveyed by teletype a number of our large offices in the metropolitan centers yesterday to determine the extent to which engineers were registering with us for employment. Now, of the offices surveyed we found that most of the engineers registered with us were mechanical engineers and perhaps the Committee will be interested in the break-down of the engineers who are registered with us. For example, 1.1 per cent of the engineering applicants registered with us are in the metallurgy field; 5.5 per cent are in the chemical field; 13.6 per cent are civils; and 19.3 per cent are electricals, including electronic engineers; 15 per cent are industrial; 44 per cent are mechanical engineers; and 1 per cent are mining. Now, of the engineers registered with us in the local offices surveyed, 44 per cent had B.S. degrees or higher. Now, of the offices surveyed yesterday, a number provided some very interesting information concerning these engineering applicants and I have five or six points which I believe your Committee may be interested in.

First, the number of engineering applicants, or a considerable number of the engineering applicants registered with us are now employed and they are very restrictive in their choice

both as to salary and as to location and as to assignment.

Second, a number of the engineering applicants registered with us have insufficient experience to qualify for the openings which generally today contain higher specifications than was true a year ago. At that point, Mr. Chairman, I would like to make this general statement that our analysis shows the specifications for job openings for engineers today to be considerably higher than they were a year ago. Now, some of the applicants registered with us, of course, have erratic work history and have received training, have received partial training in our various schools and colleges.

Now, in this latter case, the particular school or college that the individual receives training at does not necessarily bar him from all openings, but we do have some openings where it is specified in the order that certain schools are recognized as accredited and others are not.

Some of the applicants have limited education and have obtained the status of engineer in a very narrow or specialized field by dint of experience on the job, and in some cases this proves to be a great disadvantage. Here is what I mean by that. We looked over the brochure of an engineering applicant the other day and this chap was taken out of junior college and put on a special project and he worked over a year on developing a part for a missile development program which was no bigger than the rotator on your distributor on your automobile. When you looked at what he had to do with that part, it was very complex

but this chap worked on that for one solid year in a highly specialized field. Now the problem is that as he worked on that he was given an engineering classification by the firm with whom he worked, and he gained very highly specialized experience, but in today's market it is very difficult for him to sell that experience in the type of engineering openings that are available.

Some of the engineering applicants registered with us have been unemployed for a considerable time and they need to have intensive brush-up training in order to compete on the market today. Now engineering is like law and medicine and teaching and the rest of the professions. You have got to almost run to keep pace with the thing because it is dynamic. These professions are dynamic and a person has to keep abreast and if he gets his hands away from it why the parade passes him by and that is what is happening to some of these engineers who are unemployed or have taken jobs in other fields and now want to get back into engineering.

Finally we found that there are a number of engineers who simply are reluctant and unwilling to accept out-of-town jobs for these reasons: First, they own their home; second, their families are in school; and third, they have hope and they tell us that they have very good reason to believe that their former employment is going to open up and they are not about to leave, and then when this opens up not be Johnny-on-the-spot. So they are just sticking around in the hope that they will get

their former job back.

Now, Mr. Chairman, we cannot give an accurate figure as to the number of unemployed engineers in California for the following reasons. First, I think it is obvious that not all engineers seeking employment register in our offices. Second, a number of engineers register in more than one of our offices which it is their privilege to do and so that any count of our active file of applicants in engineering classifications has some duplication in it. And finally there has been a practice in industry, and this is reflected in our classification structure to up-grade many technicians who are in the sub-engineering classes, whereas in reality they do not have the education and the qualifications associated with the profession. Now, many of these applicants appear to be highly qualified in one phase of engineering and have in fact worked on this phase warranting a classification of engineer, but they are not adaptable to other openings that industry, other industry or similar plants may have. Therefore, when they register with us they are going to register in the classification which they were given in their former employment and when we analyze our files and look at their experience and the training why we find that the tendency of some engineering applicants is to call themselves engineers when in reality they are not engineers in the professional sense of the term. Now an examination of our work applications files would indicate that there are qualified engineers available in California today in our labor market to

fill openings in California. If a present surplus exists, it probably reflects the current down-turn in the business cycle and a reorganization of the defense program. We do feel, however, that in analyzing the present situation we should at all times keep in mind the long-range picture. We can always expect to have periodic economic let-downs which affect employment of engineers. This has always been true where economic cycles or engineering employment is very sensitive to economic cycles. Such let-downs have always characterized this problem but from the long-range standpoint and for the reasons I briefly discussed a few minutes ago, it would seem quite apparent that we possibly can look forward to a long range situation of engineer shortage in California and that training of more engineers is the answer.

That concludes, Mr. Chairman, my formal statement, and I would be very glad to attempt to answer any questions you may have in mind.

ASSEMBLYMAN CRAWFORD: Do you have any information concerning the efforts that have been made to build a job position with the Division of Architecture in San Diego?

MR. LITTLE: No, I do not. I would say that that recruitment is probably being handled by the State Personnel Board. Now, I would like to point out, however, that the State Personnel Board does place orders for many of their professions with us and as a matter of fact we have an order from them now for civil engineers, but we have not -- they have not placed this

order for architects with us.

ASSEMBLYMAN CRAWFORD: Thank you.

ASSEMBLYMAN HANNA: I would like to make a request of this witness and at the same time make a request of both the representatives of the University and the state college to this end, that this Committee be supplied the list, the numerical list of what you talk about, our anticipated needs in engineering based upon your experience. I think you said around 63,000 plus the 11,000.

MR. LITTLE: I have a table on that I would be glad to give to you.

ASSEMBLYMAN HANNA: Would you be able to provide that table broken down as to degree qualifications? In other words, broken down as to the number of Ph.D.'s and could you break -- possible for you to do that with the figures?

MR. LITTLE: I would like to refer to I believe it was Dr. O'Brien's testimony this morning with respect to the need for a study of this engineering field. Now, we need that in the employment business just as badly as you need it in the educational field and we do not have facts available to make this projection to the extent that you have outlined.

ASSEMBLYMAN HANNA: It was my thinking, Mr. Chairman, if we could get that in some way from the Department of Employment and we could then have these gentlemen from the University and the State Department give their indications of under present circumstances how many of these they could fulfill, then we

would know whether or not the State of California is going to be short of engineers. It would seem to me if we don't have this kind of information, it is information we should get.

CHAIRMAN SEDGWICK: Did I understand you to say that only 44 per cent of the applicants that you have are not higher than the B.S.?

MR. LITTLE: That is correct.

CHAIRMAN SEDGWICK: The majority of them are more or less practical engineers?

MR. LITTLE: Well, that is true. Certainly over 50 per cent, of them.

ASSEMBLYMAN HEGLAND: You indicated that over the past year in your observation that requirements for employment are higher now than they were a year ago?

MR. LITTLE: Yes.

ASSEMBLYMAN HEGLAND: Is this one year's experience representative of say the last ten? Are requirements in general in the last ten years tighter and tighter, more and more training required as technology moves ahead?

MR. LITTLE: Well, it is very difficult to predict on that because many of the factors which control this are somewhat explosive, but I would just have to say that the trend in the last year or so has been for higher requirements in the engineering field and from what we see as to the needs of industry and the field in both the defense field and in industrial expansion, it would indicate that requirements are going to continue to be

high.

ASSEMBLYMAN HEGLAND: From the layman's point of view it is your feeling that graduate work for at least one year is going to expand in the next ten years not only absolutely but proportionately?

MR. LITTLE: Well from the information that we have from employers I certainly think that would be a help in meeting the kinds of needs they have in mind.

ASSEMBLYMAN HEGLAND: Well, the practical import then would be that our educational system start turning out not only more graduates, but relatively more of the undergraduate students who take graduate work?

MR. LITTLE: From what I have before me and the current market and from what we have seen happen in the last few years, I would say that was the sound observation.

ASSEMBLYMAN HANNA: That is what I was getting at.

ASSEMBLYMAN ANDERSON: One question, Mr. Little. You testified that 72 per cent of your job openings require B.S. degree or higher?

MR. LITTLE: That is correct.

ASSEMBLYMAN ANDERSON: And Mr. Decker indicated that between 60 and 70 per cent of his thirteen-hundred are unemployed and they are all B.S. or higher. Is there any chance of getting together with these people?

MR. LITTLE: Well, I would hope those people would file their applications with us. It would be very helpful to us if

we could increase our labor supply for the regions that I enumerated because a considerable number of engineering applicants registered with us simply don't match current job openings. It would be fine if those folks would register with us.

ASSEMBLYMAN ANDERSON: You think they would more likely get a job with your organization than their own society?

MR. LITTLE: I can't say as to that because I don't know as to the Societies' list of job openings.

CHAIRMAN SEDGWICK: Any other questions? Thank you very much, Mr. Little, for your testimony. We will appreciate your leaving the additional data that you have with you. I think we will take a five-minute recess now.

(Thereupon a five-minute recess was taken.)

CHAIRMAN SEDGWICK: The meeting will please come to order. Dr. Vasche has a presentation he would like to make at this time. Dr. Vasche.

DR. VASCHE: Thank you very much. Members of the Committee we have three representatives of the San Jose State College here. I would like to present to the Committee Fred Harcleroad, Dean of the College and he has been dealing with construction there for the past five years and this year was advanced to the position of Dean of the College, and Dr. Harcleroad was formerly on the staff of the San Diego State College. I think he has a good understanding of our state college programs. He will present to you the two men from his institution who are prepared

to present some detailed material to the Committee.

DEAN HARCLEROAD: Thank you very much. It is a privilege for us to be here, gentlemen. Most of the material that we have to present you heard at San Jose. There are one or two things that it seemed needed to be clarified. Mr. Gunderson, head of our Engineering Department, wished in particular to see to it that some figures were corrected which he had given you at your last hearing where he has more up to date material, and likewise we wanted to give you an opportunity to hear from our Aeronautics Department Head, about a curriculum which is meeting local need, which is part of the Division of Engineering and yet which is not one that we necessarily feel should ask to receive accreditation. We have a little differentiation. Mr. Gunderson will make his presentation and then Mr. Leonard.

MR. GUNDERSON: Norman O. Gunderson, head of the Division of Engineering, San Jose State College. I should first like to thank the Committee for what they are doing and also I would like to thank the Liaison Committee for the effort they are engaging in on our behalf. I should like to say that we in San Jose State College feel that Dean Sullivan will give us a good report. We have had excellent relationships with Santa Clara College.

I should also like to commend to you the testimony of Dean O'Brien this morning. As you know, Dean O'Brien is one of the nation's outstanding leaders in engineering education and I think his theories and so on are very sound and that every

consideration should be given to his statements. Now, before the hearings in San Jose and following the hearings there, there were many articles in the paper concerning accreditation work and graduate work. And there were letters to the editor that appeared in the San Jose News and San Jose Mercury and some of these were wrong in interpretation of just what an engineer is and what he does and the needs for engineers in California and so on. And so I never did get to finish a letter to the editor, so finally last night I had it typed up in ditto form. I think some of the members of the Committee have copies of this letter. I am going to read part of this letter as an indication of the problem as I see it, and I will skip parts of it because they are not too essential to the hearing here.

First, in the letters to the editorial column there was quite a bit of confusion as to just what a professional engineer is or what an engineer is and the fields of engineering, functions and so on, so I tried to define these here, and I will go over these very quickly, starting with an engineer.

An engineer is one who by aptitude, training and experience is qualified to practice engineering. One of many available definitions states that, "Engineering is the art of the application of science to the economic conversion of natural resources for the benefit of man." And in the letter to the editors there were many references to operating engineers, draftsmen and so forth. I was pointing out that based upon these definitions, that locomotive engineering, operating engineering,

of course does not enter into the discussion.

Under fields of engineering, the classification of engineers by field or branch describes what the engineer works with. There are traditionally five main fields of engineering, civil, mechanical, chemical, electrical, and mineral. There are many subfields to each of these main fields, for example, a highway engineer is a civil engineer, an electronics engineer is an electrical engineer.

Now under functions of engineering are more descriptions of what engineering really is. The classification of engineers by function describes what the engineer does. An engineer may perform any one of the following functions: Research, development, design, construction, production, operation, maintenance, application, sales, and management. An engineer's competence in any one of these functions varies with his ability and interest in working with abstract ideas, things, human relations and money.

A research engineer must be especially capable of working with abstract ideas. He has little need for a capability in the management of money. At the other extreme, a management engineer must be skilled in human relations and the management of money. The ability to work with abstract ideas is of minor importance. In the middle range of this "spectrum of engineering", one finds the construction or production engineer who must have a somewhat balanced skill in working with things, human relations and money; the ability to work with abstract ideas is probably

of lesser importance. Each function is important in today's economy and one cannot say that one function takes higher capabilities than another for positions of comparable responsibility.

A cause of concern to the engineering personnel of the state colleges when the 1953 joint policy statement was first released was the use of the undefined word "professional." The statement assigned the university the task of preparing students for "professional" engineering practice with emphasis on the functions of research, development and design. It permitted the state colleges to train engineers with "emphasis on production, construction, operation, application, sales and service with corresponding and appropriate curricula descriptions." No mention was made of the possible professional status of engineers trained at the state colleges.

Now this was quite a sore point with the engineering departments and they felt that a civil engineer working in the design of elements of a large structure is a professional engineer even though he may have very limited responsibility and may be narrowly specialized. On the other hand a civil engineer charged with the major responsibility of planning and directing the construction of this large structure is considered to be a "non-professional" even though the requirements of the job in terms of breadth of technical knowledge and his ability to work with things, human relations, and money are much greater than those of the design engineer.

As indicated above, the joint policy statement assigned the training of engineers for the research, development and design functions to the University and the level of training designed to train engineers for the middle range of the spectrum, that is, construction, production, and so forth, to the state colleges. It recognized that even though so trained, only 30 per cent or 40 per cent of the University's graduates would ultimately perform the functions of research, development and design while the remaining 60 to 70 per cent would perform the middle range functions.

It should be pointed out here that San Jose State College was probably the only state college that subscribed to the functional differentiation as proposed by the statement. Its curricula were directed towards and named construction engineering, production engineering, and so forth. Dr. Ralph J. Smith, former head of the Engineering Department of San Jose State College and now a professor of electrical engineering at Stanford University advocated training of engineers according to this functional classification. Of added interest is an extensive testing program of the educational testing service of Princeton, New Jersey, which shows promise of bearing out his contention that identification of individuals best suited to specific functional careers is possible and that appropriate training is possible.

However, in view of the tremendous and unanticipated growth of California, the Bay Area and the college population, it is

doubtful whether the planned functional program of engineering training at San Jose State College would have met the needs of both the students and the industries which have located in the Santa Clara Valley. In 1952, it was believed that San Jose State College would never have more than 6 thousand students and that the engineering department would never have over 6 hundred students, only 2 hundred of whom would be upper division students.

In 1957, almost 11 hundred of the colleges approximately 10 thousand students are enrolled as majors in the engineering department; about 50 per cent of these are upper division students. It is now forecast that of the 15 thousand or more San Jose State College students in 1962, almost 2 thousand will be engineering majors and more than 50 per cent of these will be upper division students.

Engineering department personnel of the state colleges believe that the University of California is a great university and would not desire to develop programs that would be to the ultimate detriment of the University's fine objective. However, even if differentiation of function is proper, the same personnel do not believe that it is proper to assign a training objective that carries with it a limitation on the quality of programs to be offered. The sincerity of Drs. Holy and Semans, the writers of the joint policy statement, is not questioned; the situation to exist in California in 1958 could not be accurately foreseen in 1952.

The major concern of the state colleges was the provision which prohibited the state colleges from seeking accreditation of their curricula by the Engineering Council for Professional Development. This again implied that training was to be at a sub-professional level.

In my opinion this prohibition which was designed to insure a differentiation of functional emphasis by the University and the state colleges resulted in the opposite effect for two reasons. First, it denied the opportunity of applying for a national accreditation agency's approval of a new approach to engineering education and second, it didn't recognize the natural desire of a faculty to achieve a professional stature for its program.

The qualitative criteria used by the ECPD in the evaluation of engineering curricula recognizes such functions as construction, production and operation if proper recognition is given to the importance of an understanding of the design basis of the thing being constructed, produced or operated. In addition, one of the basic policies of the ECPD is the avoidance of rigid standards as a basis for accrediting, in order to prevent standarization and ossification of engineering education and to encourage well-planned experimentation.

On the grounds of its curricula, such as construction engineering, production engineering, and so forth being well-planned and experimental in accordance with the functional differentiation as contained in the master plan of engineering

education in the State of California, it is believed that ECPD would have given serious consideration to this new approach.

Just as an M.D. wants to operate in accredited hospitals, a professional engineering feature wants to teach in an accredited engineering school. If the opportunity to seek accreditation of the curricula is denied because of an agreement which presumably assumes that curricula in the middle of the functional spectrum are not accreditable, a very natural tendency is to reorient the curricula to the part of the spectrum which is known to be accreditable. This has been done at San Jose State College. In other words, we have left the functional differentiation as proposed in the 1953 policy statement in practically all of our engineering curricula.

Now, we will leave this sheet and go to the second one concerning the statistics. And without reading this I might just say that this was based upon neglect of the very important role that junior colleges are playing in engineering education in the State of California. If you could get junior college enrollment figures nation-wide, I would assume that California would stand about forty, which is not good, but it brings it a little higher. If you want to interpret the figures in terms of engineering degrees issued each year, you will find that California would rank about thirty-eight in terms of population per graduate from ECPD accredited institutions and thirty-four in terms of population for Bachelor of Science graduates.

I guess my last two points are that I just received

yesterday an engineering scientific man-power news letter which points out that the total engineering enrollment is at the highest level in our history; 297,000 last year, which is an increase of 7.2 per cent over last year compared with the increase of 4.1 per cent for all college enrollments. It further points out that engineering freshmen enrollment at about 9,000 students is 1.3 per cent above last year compared with .9 per cent increase for all college first-time students. I think the third point that is immensely important to the state college system and to the University, and this points out the number of engineering bachelor degrees awarded in the United States increased in 1956-57 by 18.6 per cent over the year before. The number of master degrees rose 10.8 per cent, but the number of degrees declined 2.3 per cent. Final data for all college degrees are not yet available, but it is estimated that all bachelor degrees are up 6.8 per cent, all masters, 8.4 per cent, and all doctors 3.4 per cent. This is not good news for somebody trying to look forward to recruiting teachers for engineering in college. I think it is becoming quite critical. And it might also be pointed out that industry is taking an ever-increasing proportion of the people with doctors degrees so that colleges are having a terrific time competing for these teachers that they so badly need.

My last point is concerned with the engineering crisis. I might point out we made a very rapid survey of these people yesterday to determine their employment status. Of the 29 who

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My last point is concerned with the engineering crisis. I might point out we made a very rapid survey of these people yesterday to determine their employment status. Of the 29 who

will possibly graduate this semester, 16 are definitely placed and a large proportion of these have two or more job offers, and four of these people intend to continue school either at San Jose State until June or graduate school at either the University of California at Berkeley or the University at Stanford. Three reported no job offers. They tried, but they as of yesterday had not received a job offer that was satisfactory to them. And they were not able to contact six of these graduates yesterday on this short notice.

I would next like to take the opportunity of bringing to the attention of this Committee the fact that the state colleges are serving the needs of the community and that we don't believe that they necessarily have to have all ECPD accredited programs, to meet these needs, but that within our engineering division, the division of engineering, San Jose State College, we have two departments of engineering. The engineering department has curricula in general civil, chemical, electrical, industrial, and we will have mechanical next year. These are all relatively high-level in terms of ECPD.

In the aeronautics we have two programs. The Army needs and industry needs are different, and I am going to let the head of that department of San Jose State College point that out to you.

ASSEMBLYMAN HEGLAND: Am I to assume from your testimony that you feel San Jose State and/or San Diego State and/or Fresno State should be accredited by ECPD, their courses?

MR. GUNDERSON: Yes, I do. The situation is now such that at least at San Jose State we have reoriented our curricula to the point where we are accreditable by ECPD in terms of staff, curricula, facilities and support of the institution.

ASSEMBLYMAN HEGLAND: And you feel then that accreditation by ECPD would somehow or another tend to -- some of your courses at San Jose State would somehow tend to limit your offerings in related fields of engineering to conform to a standard that apparently there is some fear of?

MR. GUNDERSON: No.

ASSEMBLYMAN HEGLAND: Thank you.

MR. GUNDERSON: I might point out that within many of the engineering schools such as U.C. or Stanford, they have civil engineering curriculum which is accredited by ECPD. Within that civil engineering curriculum they have a number of offerings such as structures, civil, -- I mean structures, hydraulics, construction and so on, and that there will be some doubt whether an institution such as this could go before the ECPD with their construction offerings by themselves and gain accreditation for that, whereas if they go with the whole package, they get accreditation for it.

ASSEMBLYMAN HEGLAND: I am glad you pointed that out. Then, the last question is do you feel that San Jose State and/or Fresno State and/or San Diego State should be permitted when the accrediting organization thinks it is wise and when the local communities think it is wise, to borrow Mr. Crawford's

comment earlier, for these three institutions to be permitted to give in the field of engineering M.S. degrees?

MR. GUNDERSON: I think it quite appropriate that the institutions in these populated areas give the fifth year of engineering work.

ASSEMBLYMAN HEGLAND: The next question isn't a question. I am making a comment. I would hope that state colleges will not accept accreditation as a part of an arrangement whereby they agree not to go into the graduate field and it could well be that you and your staff and staffs of two other institutions would be presented with that alternative after a report is published.

MR. GUNDERSON: No comment on my part. I would assume that Dr. Vasche will be very much involved in this.

ASSEMBLYMAN HANNA: Would I be making a correct assumption if I said that your testimony bears out what we heard from at least three other witnesses, that the matter of accreditation is important directly to the faculty and indirectly to the student?

MR. GUNDERSON: As we detailed in the manual we used down at San Jose State College, it does affect the institution in some ways and the student in some ways, and, in other words, it is not too important at all. It affects the institution, in that it is not able to get certain grants of equipment. It affects the students by not being able to have professional or student chapters, professional societies on campus, nor are they

permitted to join the professional society for a certain period after graduation. They are not as far as I know affected by institutions not permitting them to take graduate work because of graduating from a non-accredited institution.

ASSEMBLYMAN HANNA: Do you think you have enumerated practically all the places where the students would be affected?

MR. GUNDERSON: Just to be sure --

ASSEMBLYMAN HANNA: That part of the transcript from down south --

MR. HARCLEROAD: Recently the State Board of Registration changed the registrations -- you heard Dean O'Brien point out this morning they do not like the idea in professional engineering societies that anybody can take the examination on the payment of five dollars. Now, this was the result of a great deal of recommending which had been given a mandidate by the Legislature to make it possible for people from un-accredited institutions to take the examination. There is one other problem that arises. The people who are trained in California at an unaccredited institution and then go outside of the State sometimes run into the problem of employment. In working for other official agencies state agencies, tend to have a regulation like ours that an accredited school gives a man certain standing which allows him to take examinations or to be eligible for positions and even though they could get registration now by taking the engineering training examination in California, and then go on to professional registration in this State, they are hampered if they have to go

out of state, and Dean O'Brien this morning, you noticed, made the point there is a great deal of movement in the engineering profession.

I recall when I was in San Diego and they had a big lay-off in the aircraft industry, when Convayor laid off back in 1948 or '49 I believe, they gave them their slip on Friday and on Monday one of them was in Toronto because that was the place he could get an appropriate aeronautical position. Now, he happened to be an accredited engineer. Sometimes you can't move unless you are a professional engineer from an accredited school, and this could be a serious detriment for a student from any institution. We get lots of people from outside the State in the professions. California doesn't train its own professional people completely. We get many professional people from outside the State who come in and meet our requirements as set up. The same thing happens to our people. They go out of State and meet the requirements of other states. While I have the mike, I would like to make one other point that might not come up in the testimony. The junior colleges were mentioned this morning as a big source of undergraduate instruction in the engineering fields. Now, the problem of training teachers for the junior colleges is a serious one. We had a meeting a week and a half ago on our campus of 15 junior college presidents and deans representing junior colleges which serve this area and who send students to us. They indicated unanimously that they want us to move into a program for the training of junior college

teachers which would be in addition to the program for training of people for general secondary credentials. They indicated their main needs were in the fields of science. One of the big things they want is teachers of engineering in the lower division level, that they are not getting enough of them. And in order to do that we have to give a master's degree in order to obtain the junior college credential. They furthermore insisted unanimously that they do not want a master's degree in education. They want that graduate work to be master's degree in the occupational field that they are to teach in junior college. And they specifically mentioned engineering and physics as the two areas that are in short supply and where they would like to have state colleges and help them.

CHAIRMAN SEDGWICK: I believe you had a question, Mr. Anderson.

ASSEMBLYMAN ANDERSON: Mr. Gunderson, it is interesting to note that you point out San Jose was probably the only state college that subscribed to the functional differentiation. Dr. Smith set this program up and then you proceed to tell us that you reoriented the curriculum, somewhat the same way I suppose that some of the other colleges do. Apparently an agreement is pending in this respect.

MR. GUNDERSON: I think Mr. Hanna's questioning of the witness this morning concerned the administrative control over such things and it makes it very difficult for a college and for the State Department of Education to really evaluate changes

in engineering curricula. I know the State Department of Education has not been adequately staffed. In the positions allocated to them they should have a person allocated to them in Sacramento who could analyze the effect of these changes.

MR. HARCLEROAD: The changes in our curricula in engineering were formally presented to the State Board of Education for their approval indicating that the names that we were giving to our curricula, originally construction, production, sales application, engineering, so on, did not seem to be appropriate to meet the needs of the area which we were serving. We asked to have them changed to civil, electrical, and general industrial. It was done very efficiently and the point was clearly made that this was necessary to meet the need in the area, so it's not been something that was not clearly known by the policy-making board of the institution and the changes that were made in the curricula are not as extensive as you might think. This is not a cut and dried thing. That is, the construction operation at the Berkeley campus in civil engineering was quite similar to our construction major. Now, we put in a little bit more work in structures and we changed a few other things, but we did not make a tremendous change in the curricula.

Dean O'Brien pointed out in connection with his engineering programs that he visited in Germany that they have two programs there which gives them essentially the same background, the same courses, but they are put together in a different way. That is, they come in a different order and some are given more practical

application than others. Well, one other point that I think is important here. Before we made this change I was on a trip back east and talked with the dean of engineers who is now president of the Pennsylvania State University and asked him if in his judgment -- let me back up a minute. He is intimately acquainted with the California engineering situation as he is with all engineering in the United States because he is one of the leading engineering educators, on the same plane with Dean O'Brien. I asked him categorically could he definitely say from his vantage point that there had been a major change in the accreditation policy of ECPD since the original discussions which led to this document. They began several years before the 1953 adoption of this agreement. He sat and studied quite a bit before he gave a definite answer and he said, "I can answer that unqualifiedly, yes."

Well now, we took him to be an out-of-state reputable engineering educator and felt that we were quite justified in making this move then to meet the needs of our region and definitely making some changes which in the long run are very similar to the occupational curricula given in four years at the University. We both give occupational curricula. Sixty per cent or seventy per cent of their engineering majors go into the same thing at the end of four years. I don't think that you can draw a hard and fast line between what is occupational and what is professional in the engineering field at the end of four years of education.

MR. GUNDERSON: We do these things. We are all above-board and this change was through the State Board of Education. I should point out that it is as hard to evaluate whether a certain curriculum is oriented towards a certain construction function or whether it is oriented toward a design function.

ASSEMBLYMAN ANDERSON: Was the University aware of this change, reorientation of curricula?

MR. GUNDERSON: I don't believe that the University has really taken the time to review the curricula changes. They appeared in the catalogues that come out each year.

CHAIRMAN SEDGWICK: Mr. Crawford.

ASSEMBLYMAN CRAWFORD: I have one more question. I don't know who wants to answer this. The thought has occurred to me that representatives from the University of California stated that they were over-committed to undergraduates for graduate study and in the main their testimony in both meetings have related to the discerning the delineation of the courses to be taught in various levels of education. I am wondering if in your discussions if any thought has been given to perhaps the University of California limiting itself to graduate studies in order to avoid this duplication?

MR. GUNDERSON: Well, I would think they would have to have undergraduate programs in order to support a graduate program. I am sure the University would have to answer this.

ASSEMBLYMAN HEGLAND: Every time we talk about the Strayer report -- now for ten years in higher education, someone comes

up with an argument that if we don't follow the Strayer report about this differentiation of function that we are going to increase the cost all over the State. Now on this reorientation which has been accomplished did you notice any increase in cost at San Jose, San Diego, or Fresno, and I would like a pretty specific reply to this because this is a statement I have been hearing for ten years, that if we give up differentiation, costs are going to go way out of sight. Now, because you go from an occupational program to a professional program do you find your costs actually going up?

MR. GUNDERSON: I am sure we haven't analyzed that. I would say they would not have gone up.

MR. HARCLEROAD: I can give an answer. My responsibility is to know how much each of these different programs cost, especially in terms of faculty time. The engineering program actually is not staffed quite as well this year and last year as it was the preceding three years before that. The ratio of students to each teacher in engineering has gone up about one point in the last two years and since teacher cost is at least two-thirds of the normal cost of operating any educational institution, I would say rather emphatically that it is not more expensive the way we have done it and that there is not that much difference.

MR. GUNDERSON: I might point out that engineering is an expensive program and much of your costs involved in capital outlay for equipment and operating expenses and that you have

a certain type of functional program which was aimed at training every student in the operation of a certain type of equipment, which you might do in a functional program, that you would have to have much more equipment at a much higher annual operating expense and many more technicians.

CHAIRMAN SEDGWICK: Any other questions?

MR. LEONARD: Thomas Leonard, head of Aeronautics Department, San Jose State College. First I would like to say that aeronautics at San Jose State College is not something you -- in fact, during the junior college days in the 30's San Jose had a strong program in this field. It has grown and changed and modified as the years went by. Today we have 20 B.S. degrees offered under the engineering division. The programs do not bear an engineering title. One B.S. degree is in aeronautical maintenance. The second degree is aeronautical operations. There is a distinction between these programs and the engineering curricula. I would like to read some of this and outline other parts of it if I might.

The aircraft industry by its very nature is a combination of many industries and therefore, a college curricula directed toward this field must be designed to provide general rather than specific aeronautical skills. A broad spectrum of training requirements exists in the technical areas encompassed ranging from two year terminal programs to those of a post-doctoral level. The aeronautics program at San Jose State College has been carefully developed to prepare young men and women for

employment in many occupational areas that are found in this industry, employment areas where a college degree is a basic requirement for advancement.

I might say here in talkingabout occupational programs that we do follow to a rather great extent Dean O'Brien's statement that instructors should come from the industry. In aeronautics we have four full-time instructors, the majority of whom would meet the five-year industrial requirement plus the college background. We have four part-time instructors. These instructors come from industry. They range from Director of Engineering and Maintenance for one of the airlines to one of the Chief Project Engineers for Hiller Helicopters, Palo Alto. We note here that the advice and counsel of representatives from the airplane manufacturers, airlines and now the missiles industry has been an invaluable aid in shaping the two bachelor of science degree curricula.

It is well to point out that while the aeronautics department is a part of the engineering division at San Jose State College, neither the aeronautical maintenance nor the aeronautical operations curricula are classified as formal engineering degree programs. In general, the interests, aptitudes, and abilities of aeronautical students are such that they are better suited for training that follows other than the traditional engineering pattern. This should in no be construed to detract from the worth of an aeronautics degree, for it, as well as many other vigorous college programs, does not follow the traditional

engineering form. Actually, the aeronautics program is distinct from a standard engineering curriculum, yet it broadens the opportunities for training at our college in preparation for careers in technical areas.

In the following outline we have compared the degree in aeronautical maintenance and aeronautical operations with mechanical engineering, one of the rather traditional type of programs we have in San Jose State College. As we go through this outline, you will note in science we have a strong background, 18 degrees of science in either of our programs as opposed to the 22 degrees of science in mechanical engineering -- pardon me, 22 units. In the case of mathematics in aeornautical maintenance, our people go up and through calculus. In aeronautical operations they go through trigonometry whereas in mechanical engineering they have an appreciatively greater depth in math, ranging through engineering mathematics. I think this keynotes the level of much of our later work, the degree of mathematical background.

In engineering we have a number of courses but essentially they are lower level courses for our people, whereas in engineering they are surely quite comprehensive. Our aeronautical coverage ranges from the case of the maintenance people, courses in materials through courses in power plants, through aerodynamics with a particular degree of emphasis upon the mechanical skills. At the end of the year one of our aeronautical maintenance students is qualified to take the airframe and powerplant

examination. It is a practical examination given by the Civil Aeronautics Commission. This is not true in the operation and maintenance organization. We have more oral and written expression than the engineering program. We have more in the social science area. In the case of our operations people, they have a strong minor in business administration. I think that in general describes the two programs.

Next I have outlined very briefly some typical starting positions and ultimate positions that we find our students progress through. You note in general for the aeronautical maintenance people they are starting in the capacity either in the mechanical area or in the trainee area, and they move on positions of responsibility. In the case of aeronautical operations here they are directed more towards the business field. As a result they start in typical business starting positions.

In the next section I have listed the 1957 graduate and the type of occupational area that they have entered. You will notice people have gone into everything from fixed base operations such as Martin P. Battle, and then there is Ernest G. Pereira, service engineer for Douglas Aircraft Company at Torrance. This type of occupation is not one that requires a standard engineering program. Our background seems well adapted for training for these men. In the case of operations people, in general they gravitate towards the business field, but we find that even here two of them have gone into the

technical writer areas. This is an area of need.

I have taken excerpts from two letters I have from boys, recent letters, that I believe are indicative of the type of work they are doing. I would like to read the first one.

This is a letter from an aeronautical maintenance graduate, currently a Douglas service engineer.

"I am now in a group that designs all of the ground and flight support equipment for all three aircraft (A4D, F4D, A3D). My official title is Engineering Evaluation, sounds impressive. Basically, this amounts to evaluating the first tools built as to their ease of operation, reliability, etc. It's my job to find the fault in the equipment so that the design can be corrected prior to Naval Fleet delivery. Naturally this job calls for field contact, which is at the Douglas Flight Test Facilities at L. A. International and Edwards, so I do get around. However, like most jobs, there is paper work connected with it, and I seem to be in the middle of a paper mill."

I think this is the type of work that many of our people go into. They need a knowledge of mechanical things. They need a good fundimental background of some of our so-called engineering subjects, but it surely does not require the standard engineering training.

As a final statement, our study of the personnel requirements of industry and particularly the aviation industry,

indicates that there exists a need for a wide variety of technically trained people. Not all of these people are required to have a traditional engineering background nor will a two-year junior college program suffice. It is well within the scope of the state colleges to offer educational programs ranging from occupational majors such as bachelor of arts degrees in industrial arts through bachelor of science degrees in aeronautical maintenance and operations to professional curricula in engineering. Indeed, it is an obligation of these institutions to serve the students as well as industry in these areas. We have students that need this type of program.

CHAIRMAN SEDGWICK: Any questions from any of the members? If not, we want to thank you for your testimony and for being here today. I think that will conclude our hearing for today. I would like to introduce Dr. Dudley Robinson of San Diego State College, if he will stand up. I understand he is going to be here tomorrow and we will ask him to testify then. If there are no other questions, we stand adjourned.

(Thereupon the hearing was recessed until the following morning.)

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THURSDAY, JANUARY 23, 1958, 10:00 O'CLOCK, A.M.

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CHAIRMAN SEDGWICK: The meeting will come to order. We are short a couple of our Committee members but no doubt they will be in later this morning. Our first witness this morning will be Mr. Lyons, Coordinator of Training at Lockheed Missile Division, Westinghouse Electric Corporation, Sunnyvale.

MR. LYONS: My name is Thoburn E. Lyons, and I think for the record I should correct the fact that I am not with Westinghouse. I have no objection to the company, but Lockheed Aircraft Corporation is the company I am with, the Missile Systems Division. I appreciate the opportunity of being able to appear here today to discuss this whole issue.

But before I launch into some of the points which I wanted to make, I am inclined to recall a story. The neighbor's boy next door was getting ready for a dance and he got dressed very quickly and his mother concernedly asked him, "Well, Willie, did you take a bath?" and he said, "No." "Well, you are not going to go to the dance without taking a bath?" "Sure, I am. It is not formal."

Well, I took a bath. I thought I better get ready for any formal presentation, but I did have a few informal comments which I would like to make first. This is an interesting experience to me. A year ago last September our boss called me in and he said, "Look, we are getting ready to move the first contingent of our scientists and engineering up north to the

Palo Alto location. We are getting quiries from them about what the educational facilities are. So far, we haven't been able to give them any answers. Now," he said, "the reason is because there doesn't appear to be much our people could take in the way of courses. They want them. It is an important item to us. Now, get up there and do something. If we don't, my blood will be all over this carpet." And I had a sneaky thought incidentally that mine might be mingled with his.

Well, I went to work. A year has gone by. He has had three changes of carpets, we are both getting transfusions, and taking liver and iron pills. I don't know anything very much about the various things that have taken place over the years in terms in agreements and so on. All I know is that I am concerned and I am speaking selfishly admittedly with the fact that we have a problem, we think, in our industry and we are interested in getting something done about it.

If I were to put our interests or needs in a very few words, I would say they boiled down pretty much to this. 1. We want access to high-quality undergraduate engineering courses leading to a degree, and we want our people to be able to take these courses at night in the area where we are holding forth our company.

2. We would like access to graduate courses in technical fields. We want our people to be able to take these courses also in the area and in the evening. Now, I have been spoiled. I have been down there with a population that is pretty heavy.

I am used to working with U.C.L.A., but I don't think I should ask for any special arrangement. After all, there are a lot of other companies in the area, too. Nonetheless, let me cite this as an example. Some of our aerodynamics came to us and said they wanted a course in high-speed aerodynamics. We went to Cal-Tech. We got this man there to put on the course and U.C.L.A. paid him. The course was put on for our group. We reimbursed the students for half of the tuition. They got four units of university graduate credits. I admit this is the sort of thing I am used to. I admit also we don't necessarily expect this sort of thing here, but I am spoiled, I repeat.

Now, while I am best prepared to speak for the missiles industry in this area, Lockheed Missiles System Division specifically, I have been requested to speak for the many industries in the Santa Clara Valley represented by the Joint Council on Science and Mathematics Education. I have read the proceedings and I was present at the November hearing. I have talked to many people who are interested in this subject and it occurs to me that this whole issue calls for no criticism of any institutions or people. As I see it, the agreement was drawn up back in 1953, and it set an educational pattern and I am told at that time virtually everybody was pleased with that agreement. It didn't appear it did an important job of defining operations and responsibility, and I rather imagine it gave commensurate authority, but something has happened since 1953. It has happened all over the country; you might say all over the

world. There's been a great upsurge of technological advancement. This upsurge is being felt right in Santa Clara Valley. I wonder if enough people are conscience of what this means.

Now, as I thought over what I might well say to you gentlemen today, it seemed that maybe this was one of the points I might do well to stress when I came up here. I would suggest that we remind ourselves that two-thirds of the annual federal budget is spent on defense. A sizable percentage of this is being spent on research and development type work. Now, there are indications that the Santa Clara Valley area is in for its share of technological growth. As a matter of fact, when Mr. Little, Chief of the Employment Service was talking to us plus or minus 45 minutes, one of his people was in talking to our employment manager and was getting some figures from him predicated on some of our weapons system development responsibility The figures which he might well have presented would be considerably larger I assure you than those we did hear. I have been asked -- it's taken a little wind out of my presentation I might say -- to well not to give direct indication as to what those figures are. They are large. I thought you would be interested though in a few of the growth figures and I brought some charts along to illustrate my point. I didn't know what kind of setup we might have, but perhaps you folks will bear with me if we can't all see what I have to present.

Essentially I thought we would do well to take a look at the population. That is the population growth in Santa Clara Valley. I got these figures from the Chamber of Commerce and I

would suggest that we look at the jump in population from 1930 to 1950. This in terms of thousands and of course we start at 1930 and go up to 1957. In 20 years we had a growth of population of 145,429. That was in 20 years. Now from 1950 to 1957, this 7 years, we had a growth of 211,278. In just four years we had a growth of 125,000 which certainly compares quite favorably with the 20 years first mentioned.

We might look at this chart, industrial construction in Santa Clara Valley. This is in dollars, the orange is expansion, the white lines will be new construction. Now, the question is, did this growth in population, was it a case of farming people coming in or was it a case of construction industry coming in? From 1953, the year of the agreement to which we have referred many times here yesterday todate, 1953 to at least through 1957, there have been more new plants than any other combined period of time. This is best illustrated by these white lines here. Actually, it is 149 -- admitting that is in terms of dollars, it was 149 new plants against 86 during the period covered by the chart, 1947, to 1957. The years 1953 and 1956 speak for themselves. In dollar value they actually account for about 71 per cent of the total plant valuation shown.

Now, in the years 1956 and 1957 alone there was greater plant expansion shown by the orange color by dollar value than during all the other years combined. It is 53.7 million dollars versus 50.3 to be exact. 67.3 per cent of the plant expansion in the past ten years has occurred since 1953. Finally, since

1947, in ten years, 869 plants in the area have expanded to the tune of 106 million dollars. I think it is interesting to point out just as an indicator that in 1951 there were 15 electronic firms in the area with a population or employment total ranging from 50 to 500 people. That was the total number of people involved. In 1957 in the area there are 80 electronic firms with 12 thousand people employed.

Now, since a good deal of emphasis is being placed on missiles work throughout the country, it seemed appropriate that we might use our company as an example in an effort to determine what some of this growth I have referred to all adds up to, correspondingly what it is likely to mean to industry, our sub-contractors, and also to other companies engaged in research and development work. I don't want to bore you folks with a lot of statistics, but I think some of these numbers might well be significant.

For the first six months of 1957 we hired 82 administrative and staff personnel. In the second we hired 169. We also hired 333 clerical people as against over 500 in the second six months. There were 200 manufacturing people against 242 for the second six months; and finally we put 250 scientists to work the first six months and in the second 427. As of the 29th of December we had over 1700 engineers and scientists on our payroll. I mention this only to show a trend that will be continuing.

In 1956 when most of us in the Lockheed Missiles System Division were still located in the Los Angeles area, 42 per cent

of our professional people were recruited from the outside, the local area. In 1957 with our move to the northern location, 65 per cent were hired from or recruited from the outside. We have not been able to get these people any other way. Naturally we feel that adequate educational facilities in the area will enable us to hire more people locally. Many people will be coming into this area. I have said I am sorry I can't give you exact figures. There will be technical people, this we know. They are going to be asking for educational opportunity. We estimate, for example, that in our hiring for 1957 of the total 37 per cent will be technical.

Just a few more figures. As of the latter part of December in our company I said we had over 1700 professional people. Of these 76.3 per cent held degrees. 116 had their doctorate in science with which we are so concerned. 260 had a master's degree. 946 had a B.S. or B.A. degree. 410 had not completed a technical college training. As I see it from these figures alone, we have over 1200 employees who represent potential enrollees for university graduate work. Also every one of the 410 who don't have their degrees are going to be urged by us to get them. I repeat we are growing. As our designs are more completely developed and we get into production, we are going to be in a position to hire more people who perhaps do not have their degrees. But I can assure you of this one thing, we are going to urge them to go ahead and get more education. We will do this through all means at our command,

to-wit, reimbursement programs being just one example.

Now, I have done a certain amount of recruiting during the 15 years that I have been with the company. There are two questions that a technical man is very likely to ask. One goes something like this. "I hear that so and so is with you people. As you know, he is considered one of the best thermal men in the country. Where would I be working in relation to him?" And then the other question is, "What are the educational facilities in the area?" And I checked with our recruiters naturally before I came up. I wanted to get some indication of whether or not this still held. I am told that 75 per cent of the applicants ask this question. Now, there has been a very significant awakening in this country to the need for more and better technically trained people. The President's recent proposal for financial aid to education is a very real indication of this concern of the need to train people, not just for the future but for today. My point is, how San Jose State fit into this picture? Frankly, I think we would not be recognizing the signs of the times if we didn't try to strengthen educational opportunity in the area.

Now, it occurs to me that one way of doing this is to seek accreditation of San Jose State School of Engineering. We are convinced that this accreditation of San Jose State School of Engineering is necessary for a number of reasons. Certainly the trend in manufacturing throughout the country, certainly in our area, is upward in the technical scale. That is, industry

needs a higher caliber work. For example, industry in this country employed one engineer for every 250 employees in 1900. In 1952 the average was one to every 60. In the General Electric Corporation I am told, I think this figure comes from within the last two years, that one man out of every 13 is a scientists or engineer.

In our division of Lockheed located in the San Jose area over 28 per cent of the work force assigned us will be engineers. This, gentlemen, is a trend of the immediate future. Now, essentially we have taken care, our company has taken care of a significant number of the technical employees' desires for advanced training, the cream of the crop you might say. We have done this through the honors cooperative program which we have in other industries.

Right now, for example, we have 190 employees taking work for advanced degrees at the University of California and Stanford. Now, while highly satisfactory this is a difficult and not inexpensive program to administer. Stanford rightfully enough maintains a quota for industry. We have consistently enrolled to this quota and we see no chance of its being increased. Stanford offers no part-time undergraduate work and has no evening programs. The University of California is 50 miles away and few if any graduate courses have been offered in the area for University credit. Now, I understand, of course, -- we heard yesterday that plans are underway to carry on with the graduate program in the area. Now, the point is, what is the

answer for the great bulk of our people who will want to continue their technical training? We feel that there is evidence that our technical people want the guarantee of quality that accreditation usually means.

Now, last year I attended a two-day symposium at U.C.L.A. Dean O'Brien of the University of California and many other respected educators were there and took part in the program. The big emphasis seemed to be what could be done to raise the status of the engineer and the school in which he got his training?

Now, it occurs to me that accreditation is one way of doing this. Besides quality of education it means some other things such as enrollment of a higher caliber student body, better equipment, better quality of teaching staff. Now last week I was talking to some of my people and I said I would like something concrete I could take along with me. Let's ask some of our people what their reaction to this accreditation business is. So we did.

Now, we picked 15 people, you might say across the board and we tried to make a rough sampling out of this. These were all people with master's degree or Ph.D. who at one time had held teaching positions in universities. We asked them this question, "If you were considering returning to a full-time engineering-teaching assignment would accreditation or the lack of it by ECPD be an important factor in choosing a school where you would teach?" With one exception the answer is that

accreditation would be most important. Now, I will grant you that 15 is not -- it is a limited sampling certainly. But I give this as an example, as certainly an indicator. Now, in summarizing my presentation, it is redundant to observe that the hour is now for this country to awaken educationally.

Certainly, it seems to me that agreements that were good in 1953 don't necessarily apply now. Santa Clara Valley electronic devices, atomic power ballistic missiles, rockets, like Lockheed's Polaris, are going to be the new projects with new products. As I drive to and from work I note, and I am sure you folks do, the orchards are going. The agricultural worker and semi-school tradesmen are being replaced by men of science who are working in most sophisticated and complex fields in the world today. Future developments are going to be even more demanding in terms of competence, understanding and education. Now, we don't want all chiefs and no Indians, certainly. We know we are going to need a lot of technicians. They are going to have to be trained. Not everybody certainly will have to have a master's degree or a Ph.D. I am not unmindful of this fact, but certainly in our effort to get qualified people and in our effort then to give them the opportunities to increase their knowledge in an ever-changing rapidly advancing field, again speaking selfishly, we would like all the facilities that we can get to help us do this job. Now, I remind you I have used my company to illustrate some points, but I speak for the many companies in Santa Clara Valley whose problems are similar to

ours. So again, I would like to thank you for this opportunity and if there are any questions I would certainly be glad to try to answer them.

CHAIRMAN SEDGWICK: Mr. Anderson, I believe you have a question?

ASSEMBLYMAN ANDERSON: Are you people taking advantage of these extension courses that the University is now providing at Redwood City and Palo Alto?

MR. LYONS: Yes, they are. They aren't taking advantage of them as much as I would like. I think there will be a little more information on that from some other individuals. There aren't as many being offered as we would like. I refer to the fact that they do not -- they may offer credits, but not for any particular degree in some instances and many I believe are in the so-called 800 series or so-called professional courses.

ASSEMBLYMAN ANDERSON: If this program is expanded with this University that they plan for Santa Clara Valley, and if those courses are still of an extension nature, not applicable to graduate degree, will that be of additional service to your industry?

MR. LYONS: Well, certainly any course work that is related to the sort of thing we are doing is valuable and we -- incidentally I have a budget on my books for every year wherein we will put certain courses on ourselves and use some of the professional people we have to teach those subjects and to meet a demand that might be peculiarly related to our business. So

we are willing to do that ourselves and we encourage our people to go to the universities and take various courses. It is certainly to our advantage. This course in space technology that was mentioned, it is an excellent thing. More people of ourse should be going than are, but it happens that only 47 are registered for this particular course. I say "only", but I think one of the big factors is in the location.

ASSEMBLYMAN ANDERSON: With respect to this point of a graduate program for M.S. degree at San Jose State, will this additional expansion of the extension program down there -- would that be sufficient to satisfy your needs or do you still feel that you need this program at San Jose?

MR. LYONS: Well, I don't know if I fully understand your question. The present M.S. degree offered by San Jose State has not proven to be of great interest to our people. They would like to have more. And I think that answers but a portion of that question which you asked. Let's put it this way. Our experience in the California Division where I was in charge of engineering training before I came up here was that approximately 15 per cent of the technical people would at any one time be going to courses, extension courses at night. Now, these might include, we would put on or U.C.L.A., or U.C. might have to offer it in the area or on the campus. Probably 25 per cent would attend, would be going to extension courses up here.

ASSEMBLYMAN ANDERSON: You have been unable to seek the cooperation of the University to put on your course such as you

found in Southern California -- you referred to this example of going to Cal-Tech.

MR. LYONS: Well, to be downright honest with you, we have not tried that approach up north. I used that as an example to show you that was the ease with which we were able to operate there and to get people able to take a graduate course off the campus taught by good professional men, but at the same time get a graduate credit for it.

ASSEMBLYMAN ANDERSON: Have you considered doing that up here?

MR. LYONS: Yes, and I anticipate that -- admittedly we haven't been after any so-called special arrangements yet. We have been just concerned with getting those programs going that would meet our every day requirements.

ASSEMBLYMAN ANDERSON: But if you do need those special arrangements, you will go after them?

MR. LYONS: Yes. I have been, you might say, cutting the dog's tail off a little at a time.

ASSEMBLYMAN ANDERSON: That is all, Mr. Chairman.

CHAIRMAN SEDGWICK: Any other questions?

ASSEMBLYMAN DOYLE: Mr. Lyons, we hear a lot about too many scientists, not enough scientists, engineers that are unemployed and so forth. Do you feel in your business that we have a shortage of scientists and engineers or is it a shortage of facilities to train them after the industry gets them?

MR. LYONS: Well, I can say yes to both of those questions,

I think. There are always some engineers, and I put quotes around the word, and I think again the gentleman yesterday mentioned this, I believe it was Mr. Little, there are always engineers, so-called, who, well nobody wants them too much.

ASSEMBLYMAN DOYLE: You wouldn't hire them in other words?

MR. LYONS: That is right. We couldn't fit them in any place. We get pretty desperate at times and we take people on and when we do this why one of the things we count on is a special program of instruction. We may put some courses on ourselves and do this job. So certainly for the kind of people we need we cannot get them. I think Dean O'Brien mentioned yesterday that we are having trouble getting college kids to want to go on and take additional degrees. They reach a saturation point, they want to go out and go to work. We are going to be looking for 40 more individuals to get into this cooperative program I mentioned. I don't know if we are going to find them by next September in time to get them enrolled at Stanford and Cal. Finally then, when we get these people on Board, they are interested naturally in going ahead with various courses. Now, I know that U.C.L.A., a recent report I have read, has said that their program of so-called professional courses is growing considerably. That is, these are courses that don't give degree credit and this will continue to be so because like the space technology course and others they will offer special kinds of information that individual will want. So, I expect this will continue to grow, too.

ASSEMBLYMAN DOYLE: This matter of accreditation, is it the student that wants this accreditation program, the colleges -- are they the ones that are pushing it, or is it the professional educators that are opposing it? Let's find out where we hear both sides -- some want it, some don't want it. Your testimony here would lead me to believe that the people you talked to want it. Now, do they want it because they feel that the students want it that are in this particular course?

MR. LYONS: Well, they want it and I think it is a matter of the hen or the egg. They want an education which they feel carries with it a semblance of guarantee that it is from a good outfit, that the outfit is recognized, that it is known that it has professors that are known in the field and they aren't necessarily always sure what makes for this. But this is certainly something they would want.

Now, I personally think that accreditation does give a school a standing, and when I have been out recruiting I carry with me actually a listing of schools that are accredited and when just a fresh young college kid who has not worked has come to me for a job -- this was particularly back east where I didn't know my way around among many of the schools -- I looked the school up and if it was not listed, I did not make the young man the same offer. It was a lower offer than if he had gone to an accredited school. He might have been better than many of the others, but I felt I had this much of an indication on paper at least that here was a man that had gone to school that had

certain standards and that we could look to and expect him to do a certain amount. Maybe that is wrong.

ASSEMBLYMAN DOYLE: You are saying that it is to the disadvantage of a young man who goes to a school that isn't accredited?

MR. LYONS: I would feel so; I can't speak for all the companies certainly, but that is so with many. I am sure many of the airframe outfits and I am sure it is true with ours.

ASSEMBLYMAN DOYLE: Would you say those who oppose accreditation do it on the basis that they don't feel it is needed or that it is important as you describe it and other industries might? Why is it opposed? Why the opposition?

MR. LYONS: Well, it is pretty hard for me to second guess. I don't think it would be proper for me to. I think that many people feel that the State schools -- this is my own personal feeling, that the state schools have a certain job to perform, that if they are accredited the curricula will tend to go in the same direction as the University's. Then the schools will no longer be performing this job that it is felt is so needful for them to do. Now, that is why I based some of my presentation frankly on the fact that I think that certainly from our standpoint we have got to raise the level of some of this engineering from plumbing and animal husbandry to some of the things that are going on today. I refer to our area.

ASSEMBLYMAN DOYLE: Thank you.

ASSEMBLYMAN CRAWFORD: Would you repeat those figures you

have concerning the ratio of engineers and scientists to workers again? Do you have that handy?

MR. LYONS: I pulled this out of a speech. In 1900 for example, I said the engineers or industry in this country employed 1 engineer for every 250 employees. In 1952 the average was 1 for every 60. The General Electric Corporation today has 1 scientist or engineer for every 13. I am not sure when this was published but I think it was two years ago. And then I said in our outfit why it looks like about 28 per cent will be scientists and engineers.

ASSEMBLYMAN CRAWFORD: Thank you.

CHAIRMAN SEDGWICK: Any other questions? Mr. Lyons, I believe you stated that out of the 1700 odd engineers that you employ there were 116 that had a Ph.D. degree and 260 had a master's degree, 940 a bachelor's degree and 410 without a degree?

MR. LYONS: Right.

CHAIRMAN SEDGWICK: I believe I understood you to say you have recruited a lot of these men with a master's degree and the Ph.D. degrees from colleges. I presume that your lure was probably a little higher pay than they get teaching in the college. Now, I am wondering whether or not we are going to have a great enough supply of higher degree men to teach the subject in the colleges that we are talking about. We have got to have qualified teachers in these colleges to bring along new engineers with the higher field of science and mathematics. I do know that

some colleges are having difficulty in recruiting instructors for the colleges. Now, it seems to me that industry is going to rob Peter to pay Paul and I just wonder where we are going to be in the end.

MR. LYONS: Well, in response to that, I might say this is an ever-present problem with industry. I wish I had a good answer for it. We know full well you can't keep pumping a well unless it rains now and then and something must certainly go back into the system. Now, we are trying to meet some of that admittedly through letting some of our people teach in the universities -- I say "letting them," encouraging them to. This still won't make up for what we have done, you might say. We try to do it through work with the schools to encourage kids to go into the science and mathematics fields. There are any number of ways that industries throughout the country through grants and through scholarships can help. Industries are trying to carry on in this fashion. In this same symposium which I attended last year I think it was someone from Purdue that mentioned that the small schools, colleges, are experiencing the same problem in the educational circles. The bigger schools pull away because they can offer higher money to the better professors. And that leaves the small schools that have such an all important role to play in their communities, leaves them in many cases with second-grade type instruction. I don't mean that in the -- I mean it is not first-class instruction.

CHAIRMAN SEDGWICK: Do you feel if we had more accredited

colleges teaching engineering that we would develop more engineers than we do at the present time on the higher level?

MR. LYONS: I think it would help. Everything we do to raise the level of instruction that will permit the acquisition of better facilities, plant equipment, I think it should be a contributing factor.

ASSEMBLYMAN HEGLAND: Mr. Chairman, I wasn't going to ask any questions. This isn't a question, but I just want -- you brought up the subject of scholarships. Now, some concerns have done a wonderful job, like yours, and IBM and a few others on this training within your own group, and some concerns have done a very good jobs in working with merit on scholarhips. Now, would you be willing to recommend to your own board of directors that Lockheed increase substantially the scholarship awards almost right away, since as you put it so beautifully awhile back this is the hour to wake up?

MR. LYONS: Well, I can't tell you what their thinking is for the moment.

ASSEMBLYMAN HEGLAND: I wasn't asking you what their thinking was. I was asking would you be willing to make the recommendation to this man whose blood will be commingled with yours?

ASSEMBLYMAN ANDERSON: Is commingled.

MR. LYONS: Well, I would certainly recommend it. You know we do give 20 scholarships every year that are considered about the best in the country, and that includes full tuition and the

works.

ASSEMBLYMAN HEGLAND: The reason I mention this is because the proportion of money by a lot of large corporations and I believe Lockheed was on that list, the proportion of money on your inplant training program in contrast with the amount of money being spent for scholarships -- this proportion has been slipping the last three or four years.

MR. LYONS: That could be. I wouldn't be able to say what all the reasons might be. Some of them certainly are that we have immediate requirements that we have to handle right now and if you have train, for instance, a lot of manufacturing people in soldering techniques that are required to meet the specifications of the Air Force, why you have got to spend some money getting some people and equipment on board to do the job.

CHAIRMAN SEDGWICK: Mr. Lyons, if there are no further questions, I would like to thank you for appearing here and giving testimony this morning. I certainly appreciate it. Now, our next witness this morning is Vernon B. Westburg, West Coast Electronic Manufacturers Association.

MR. WESTBURG: My name is Vernon B. Westburg. My title is Executive Engineer with the Stanford Research Institute. At the Stanford Research Institute I am secretary of our Education Committee. However, my remarks today are to be addressed as Chairman of the Education Committee of the West Coast Electronic Manufacturers Association, particularly the Education Committee for the Northern Area. Now, Mr. Chairman, may I address a comment

to the last question you asked to Mr. Lyons? It is of a rather personal nature. I wonder if it could be off the record before I go ahead with the presentation.

CHAIRMAN SEDGWICK: You would like to have it off the record?

MR. WESTBURG: Yes, it is a personal comment. It isn't too relevant.

(Thereupon Mr. Westburg made an off-the-record statement concerning salaries for university instructors as compared with the same person working in industry. Then his presentation was given as follows.)

MR. WESTBURG: Chairman Sedgwick, and members of the Committee, in the previous statement made in San Jose on November 15, 1957, the scope of the West Coast Electronics Manufacturers Association, the growth of the electronics industry in the Bay Area, the shortage of adequate graduate educational opportunities on the lower peninsula, and the results of several questionnaires to ascertain the size of the demand for graduate study were among the topics which were covered.

Today, we would like to speak particularly to the need for accreditation of engineering schools in our State and to the type of curriculum which the electronics companies feel is needed for training its engineers.

<u>Accreditation of Engineering Schools:</u>

The companies of the West Coast Electronic Manufacturers Association are of the opinion that:

1. There will be a continuing need for qualified engineers in the field of electronics in the Bay area. A large percentage of these engineers will be needed for work in research and development reflecting a high level of technical ability. The remainder will be needed for engineering functions associated with the production of vital defense tools and weapons, including such things as vacuum tubes, antennas, communications systems, electronic instrumentation, computors, microwave equipment, and electronic components.

2. There is a great need for competent technicians as well as engineers -- qualified people who can support the engineer in his tasks by carrying out assigned duties. These technicians do not need an accredited degree, nor do they need four years of college training. Hence, in considering four-year engineering schools, we are concerned primarily with the training of engineers not technicians. Two years of study at a junior college in a trade preparatory course, plus on-the-job training is adequate for the average technician.

3. Many of the top engineers for the electronics industry are now recruited out of state. The State of California is not training engineers in adequate numbers to supply the needs of local companies for electrical engineers.

4. In view of the increasing emphasis on the role of electronics in defense and the pre-eminence of Bay Area industry in this field, it is expected that the need for qualified electrical engineers will become even more evident in the future.

5. Accreditation as a criterion of excellence of preparation in the field of engineering has been and will be continue to be of great importance in the selection of engineers, notwithstanding arguments pro and con.

6. There is now a shortage of accredited engineering schools in the State of California.

7. No engineering school, otherwise eligible, should be restrained by agreement from applying for accreditation from the Engineers' Council for Professional Development. We would like to include in the record a letter from the Chairman of the Education and Accreditation Committee of the Engineers' Council for Professional Development, Professor W. Alford Everitt, in which he states: "I am aware of the situation in the State of California. I know of no other state which has any restrictions on the application of engineering schools for accreditation from ECPD and I am reasonably confident that none exists."

Now, I wrote him this letter about three weeks ago and I specifically stated that I was wondering whether there was any knowledge of such a situation of restraint existing anywhere in our nation. I mentioned specifically that I was going to be appearing and was interested in obtaining this information in order to give it to this Committee. And this was the letter which he sent. You have all heard the old chestnut story about the mother whose son had been inducted into the Army and she turned out for a parade and proudly watching her son walking down the street with the throngs cheering on either side she nudged her

neighbor and said, "Look, everybody's out of step but Johnny." Well, I am just wondering maybe this type of situation applies today. Maybe everybody is out of step except Johnny. I don't think that is the case. I think we are here today to evaluate the situation and view it in its proper light.

Curricula Offered by Engineering Schools:

The companies of the West Coast Electronic Manufacturers Association are of the opinion:

1. Many engineering schools in our country have developed sound but differing programs for the training and education of engineers. These programs should be continually reviewed to insure that the subject matter and the methods of instruction are appropriate to the current needs in the fields of engineering. It is gratifying to observe that such evaluations are under way.

2. Because of the breadth of subject matter which is embraced in almost all phases of engineering today and the necessity of considering systems as opposed to components, a thorough background in the fundamental concepts which apply interchangeably to all fields of engineering is essential in any engineering course. Basically, engineering courses should be broad and fundamental, should stress the underlying mathematical and physical concepts, and should eliminate unnecessary specialization and duplication of material.

3. The accreditation procedure which has been set up by the ECPD reflects the opinion of the engineering profession as to what constitutes the desirable educational training of an

engineer. The accreditation procedure was originated specifically to insure that such curricula are recognized and encouraged.

4. The type of engineering curriculum which is a prerequisite to engineering employment by the WCEMA Companies is the type which is specified by the accreditation standards of the ECPD. We therefore favor the further development of such curricula in the State of California, where appropriate, and the recognition of such curricula by the mechanism of ECPD accreditation.

CHAIRMAN SEDGWICK: Any questions from Dr. Westburg?

ASSEMBLYMAN ANDERSON: Taking this number 4 in your last remark here, do the firms that belong to your organization consider ECPD accreditation when they hire new job applicants or when they consider advancements or other competitive items within their organizations?

MR. WESTBURG: They certainly do. I would not care to comment on whether this is a good or bad criteria. All things in life are imperfect, but they certainly do consider this is a vital point.

ASSEMBLYMAN ANDERSON: Which region is California in this ECPD lineup?

MR. WESTBURG: I don't have that letter and I wrote to the general office back east.

ASSEMBLYMAN ANDERSON: It indicates certain chairman, vice-chairman for each region. I am just wondering.

MR. WESTBURG: I don't know. Possibly Professor Gunderson might have the information.

ASSEMBLYMAN ANDERSON: Getting back to these first remarks you made, it is sometimes said that there are certain other advantages in being a college instructor, certainly aesthetic values, perhaps the academic atmosphere and so forth, which would compensate in some manner for a lack of salary standards and so on. Do you think that the standards of compensation should be the same for an instructor in the college as they are in industry?

MR. WESTBURG: No, I do not think they should be the same because in general the salary for instructors or professors is based on a nine-month instructing year. Consequently you would expect a differential of say 20 per cent or something like that. I do not think they should be the same necessarily for the same caliber of man. At the present time, however, in many locations they do not even equal this level and this is what this report I referred to has shown.

ASSEMBLYMAN ANDERSON: If the university instructor worked a full 12-month period would you expect the same salary?

MR. WESTBURG: I would expect under those conditions the same salary and as a rule of thumb I would expect that if you took the engineer employed 12 months and divided his salary by 12 and then multiplied this figure by 9 that this is what you would expect as a base salary for a professor. Many professors in engineering are able to get gainful employment during the summer months in companies and many of them do consulting, so they do supplement their income, but in general I feel the base

pay is low, maybe 20 per cent.

ASSEMBLYMAN ANDERSON: Thank you.

CHAIRMAN SEDGWICK: Any other questions? If there are no other questions, I want to thank you, Dr. Westburg, for appearing this morning and giving your testimony. I would like to call Dr. Dudley Robinson from the State College in San Diego at this time.

DR. ROBINSON: My name is Dudley H. Robinson. I am Chairman of the Division of the Physical Sciences at San Diego State College. This Division includes science departments, mathematics, and engineering. I am in the physical sciences department. I do not have a prepared statement, but rather some notes, and of course I would like to say that I certainly enjoy the privilege of appearing before this group and participating in this meeting.

Now, we in the state college system very sincerely appreciate your interest and your courtesy. Yesterday, Mr. McCaffrey and some of his people from the University of California gave you a very well organized and prepared picture of the University's stand in this discussion about what should happen to engineering in the state college system, and we in the state college system very greatly appreciate their sincerity and their fairness and we have a tremendous respect for their professional stature and their outstanding engineering program.

You yesterday heard from Mr. Decker and Mr. Little some statistics on supply and demand, and today we have heard some

remarks from people in industry. My only regret about this hearing is that there has been so much talk about San Jose and so little about San Diego. We do have the same problems. Dr. Vasche has described Dean Sullivan's assignment and the procedure that is to be followed in considering this problem of accreditation for state colleges by the Liasion Committee. During these discussions there has been developed for your information a background of the history of this agreement and the situation as it now stands in engineering education. So I think undoubtedly you have a very good outline of the general picture of the problems in engineering education in the State of California. Even so, if I can do so without seeming presumptuous I would like to add some brief comments.

First, I would like to start by saying that I think in these meetings perhaps more emphasis should have been placed upon what I call the greatness and the uniqueness of the state college system in San Diego and California, excuse me. We think it is great in San Diego, too. First, in the matter of size we have an unusual organization in the state college system in California. I understand that the total enrollment on all the campuses of the University of California is now approximately 43,000 students and that the comparable number for the state college system of total enrollment in all of the state colleges in California is approximately 50,000. So this means that the state college system in California taken as a whole is one of the largest, if not the largest collegiate organization in the world. Not only is it

great in size now, but it is without doubt one of the fastest growing large collegiate organizations in the United States.

In fact, our growth in the periods since the war has been almost explosive. In the field of science and engineering the growth has been even more rapid, more explosive than in the total college enrollment for the state college system. For example, next September, San Diego State College -- we have been allocated a certain number of new positions for the total teaching staff of the college. Our division includes the physical sciences and mathematics and engineering. The San Diego State College has been allowed or allocated something over half of the total number of new instructors to be added next year to the total college staff.

This growth of science and engineering in the state colleges I would like to emphasize is not post-sputnik, but is something that has been developing over a period of years and which we have been planning for for a considerable time. This growth of physical sciences and engineering actually started before World War II in San Diego, and I think similarly in other state colleges.

And this growth of science and engineering training has been snow-balling, that is, not only growing rapidly but growing at a rapidly accelerating rate and we in San Diego have attempted to meet demands of community industries and the demands of students and the demands of their parents.

Another point I would like to make about the state college

system is that we have a tremendous building under way that is almost unbelievable. San Diego State College has 12 buildings. None of them are small buildings. Two of these have been started, some more will be started this spring and this total of 12 represents the number of buildings which will be completed during the next two or three years. San Diego State College when put into operation this past fall had a humanity building as we call it, which is one of the largest single classroom buildings west of the Mississippi River. In March we expect to break ground and start construction of the chemistry and geology building which is to cost something over 4 million dollars and in floor space will be even larger than this humanity building that I mentioned. During the next two or three years we will make an addition to our physics building which will approximately triple our present facility. Our present facilities, our new physics building, as we call it, has been in service only slightly over three years.

In the engineering department we are planning a building which will be about six months behind the physics building and this will approximately quadruple our physical facilities in engineering and here again we are now occupying what we call the new engineering building and have been in it only a year and a half.

Some other facts about the state college system that I would like to call to your attention are these: First, our facilities are good. They are overcrowded. But we are convinced

that in quality of physical facilities we are far above the national average for undergraduate work, especially in the sciences and engineering, and by national average I mean the national average of well-recognized outstanding colleges and universities which specialize in this work.

Another point I would like to make is that our students are good students. We accept only the upper 45 per cent of high school graduates and this also is far above the entrance requirements of most of the famous western universities for example.

Concerning our faculty, we consider our faculty far above the national average, both in academic preparation and in engineering, for example, in industrial experience, and even more important in their performance in the class room.

Finally I would like to say that the curricula and courses which we offer at San Diego State College, we believe, meets every reasonable test for excellence. So what I have tried to emphasize is something that I am sure that you know but I hope you will keep in the forefront of your mind and that is that the state college system in California really is something very outstanding both in size and in quality.

And this leads to the next point, the reason for going over this information, and that is that this places a very grave responsibility on the people who direct and control the state college system. It places a grave responsibility on the Department of Education and all their officers, on the State Board of

Education, and on the Liasion Committee which we have talked about and finally upon the State Legislature. In the hands of these people or groups of people is the future of what I consider the greatest collegiate organization in the world. So these people must work hard. They must cooperate. They must check up on each other and they must needle each other into greater and more effective effort. They must do this continuously and I think this is necessary to avoid breaking faith with the taxpayers who support the state college system.

I assume that this is the real cause of the interest and the effort of your Committee. Now, during the discussions yesterday and this morning some more specific points which I would like to comment upon briefly include these:

First, we have heard a great deal about differentiation of function between the university system on the one hand and the state college system on the other hand. I wish to assure you that differentiation of function does exist. Without going into details I think you already have enough information to realize the programs in the state colleges are different from those in the university, but I would also like to emphasize that there is not only differentiation between these two systems, but there is even greater differentiation in my mind between the state colleges, between the components of the university system within the state college system. We have San Jose, Fresno, San Diego, Cal-Poly which has been mentioned frequently in your discussions, and the programs at all of these places are different.

They have a different emphasis. Now, they have widely different curricula. To this list of the ones which have been mentioned in your discussions, we should also add that engineering work is being given at Los Angeles State College, at Long Beach State College, Sacramento State College, and some others, and the programs do differ in these schools.

For example, in Fresno they give a program in agricultural engineering. We do not do this in San Diego because we are in a different environment, different type of community. The demands are different. I have mentioned that there is a differentiation of function between the components of the university system also. I think probably there is a greater difference or greater differentiation of function or emphasis between the University of California at Berkeley and the University of California at Los Angeles, a greater difference there than there is between the state college systems and the university system in general.

I think this is right and it is a very common situation that schools differ in their emphasis, in their function, their objectives, even though they all give something which is called an engineering program.

This difference in emphasis, performance of various schools, depends upon a very large number of factors. It depends on local conditions. It depends upon traditions that have been set up over long periods of time which are sometimes called vested interests, and it also depends upon who the faculty

leaders are, what their specific interests and drives are. I am sure that it is right that San Diego State College should not have a cyclotron and radiation laboratory comparable to the facilities which we find at the University of California at Berkeley, but I do want to make the point that this kind of differentiation would be accomplished even if there were no engineering agreement or no Liasion Committee.

There are so many other checks and balances that I can't imagine any serious troubles being caused by San Diego State College, for example, attempting to duplicate the facilities at the University of California at Berkeley.

Concerning this differentiation of function, getting away from the engineering for a moment, I would like to point out another type of differentiation of function. The University of California at Riverside, for example, is avowedly a liberal arts college. This is the purpose of organizing this institution and this they state is their primary objective. San Diego State College is also a liberal arts college. It is a legally defined objective of San Diego State College, and yet there are great differences between Riverside and San Diego State College. For example, the faculty at the University of California at Riverside are strongly encouraged, in fact I would say required, to do research because this improves their quality as instructors. It improves their ability to instruct in chemistry, for example. It keeps them up to date. And yet because of something like the engineering agreement, although San Diego State College is supposed

also to be a liberal arts college, our faculty are almost prohibited from doing research, so I say there is differentiation of programs. It does exist. It is very wide-spread and I think it is a greater differentiation than perhaps some of you realize.

Now, another point which I would like to make is that yesterday Mr. Little said to you that job specifications for engineering positions are constantly requiring higher and higher levels of training. This is exactly what our experience at San Diego has been. This constant emphasis upon requiring more intensive training in fundamentals in higher level of training in science and engineering has forced the development at San Diego State College of a master of science program in physics, chemistry, and mathematics, and we are now very strongly feeling the same pressure in the field of engineering.

I would like to say that this development of graduate programs in chemistry, physics, and mathematics, and the pressure for it in engineering is not due to the fact that our instructors are graduates of the University of California.

Dean O'Brien made this point that people who are trained at the University of California have a research attitude and background and they go out and teach in state colleges and so this attitude filters into the state colleges. This is true to a certain extent, but not because we recruit our teachers from the University of California. Our engineering department out of a total of about 20 people, if I remember correctly, only 2 of them have taken training at the University of California.

Now, this pressure of higher and higher requirements for employment in the field of engineering and related sciences is partly responsible for some changes that have been taking place within the state college system. Perhaps it is not proper for me to comment upon the program at Cal-Poly, but I do believe that somebody should mention the fact that although the program at Cal-Poly started out as a so-called up-side-down program, it has undergone considerable change. More and more the program at Cal-Poly is developing toward what I consider the traditional engineering type of undergraduate training. Please don't misunderstand me. Cal-Poly still has a program which is quite different from that of any other State college. They still do work more with hardware than we at some of the other state colleges do. However, in examining what they are doing by looking at their catalogues and curricula, visiting their campus and by talking to their people, I have found that in the field of electronics, for example, there isn't a whole lot of difference between what is done in Cal-Poly and what is done in any other state college.

The Cal-Poly program of electronics requires just as much mathematics and requires just as much intensive training in fundamentals as the program at San Diego or San Jose or at Fresno.

Another point which I would like to comment upon very briefly is what Dean O'Brien said and many others implied yesterday, that accreditation is perhaps not as important as we

have given the impression that it is. I do want to say that the fact remains that accreditation by ECPD is the only means of which an engineering department, personnel of an engineering department in their performance can be judged by our peers. Regardless of the exact system by which this accreditation procedure was set up, regardless of which technical organizations sponsor and support it, it still is true that this is the only recognized procedure for an engineering curriculum to gain a stamp of approval which is recognized, and believe me it is important. It is important in hiring staff. It is important to the student for many reasons which were mentioned yesterday.

Finally, one other thing and the last thing that I wish to comment upon was the suggestion that perhaps the state college system should adopt the German system of greater emphasis upon the training of technicians. Undoubtedly this German system has great merit, but our experience in San Diego and I am sure that it is true in the other state colleges has been that such a system cannot be forced upon our American system of education. At least it cannot be forced upon San Diego. In San Diego we do not have a tradition of highly technical apprenticeships. Industrial development in San Diego is much like that in the Santa Clara Valley. It is comparatively recent and so as I say we do not have a long-standing tradition of intensive and extensive technical apprenticeship training.

Now, in Detroit and some of the other older industrial centers of the United States this tradition does exist and in

Detroit, for example, or in that general area, we have the General Motors Institute which is the type of program which I think was referred to yesterday, and here these programs have found success and they are meeting a need, but so far in San Diego and San Diego State College our students simply will not buy such a program.

Thosethat are interested in what I call technician type of work and technical institute type of training, those that are interested in this, go to the junior college and here there are very fine opportunities for apprenticeship type of training in relationship or in coordination with other job training and this is popular with a certain type of student.

Now, admittedly as industry becomes more complex and greater demands are placed upon technicians of this type, they are going to need, in fact they already need more college work than is given by our existing junior college programs. At the present this need is being met by on-the-job-training sponsored by industries or by programs which make it possible for these people after they have completed their junior college training to go through an apprenticeship and gain experience on the job after these programs are in existence which makes it possible for them to come back to college and usually on a part-time basis take further college work. This I think is a development which is coming, but the point I make is that it is not here at the moment, at least not in San Diego. In San Diego the biggest employer, the one that employs the largest numbers of our

graduates is Conveyor, and the President of the San Diego Division of Conveyor continuously stresses the need for technicians. However, he in his industry and related industries in San Diego, do not look to the State college to meet this need, but are depending upon the system that I have just mentioned, junior college training and apprenticeship in a trade and some experience on the job and then further training either on the job or by going back to college. He and the other local employers in San Diego tell us that San Diego State -- what they want from us are engineers with a very thorough training in the fundamentals of engineering.

We do feel that we have a very close contact with our employers in the San Diego area. We talk to them constantly. We have a very active and very effective placement service which collects all kinds of information and constantly we ask the questions, "Are we doing the things that you want? How can we improve the program?" And always the answer is the same, "What we want are engineers who are trained in the fundamentals of engineering and have the capability of development." We have on many occasions specifically the question, "Would you prefer men who are trained in handling hardware so he can come on to the job and immediately fit in without much on-the-job training or would you prefer to sacrifice some of the more intensive and extensive training in engineering fundamentals?" And the answer always to us has been, "Give us the man who although he may need some on-the-job training when he first comes to us, has the

capability of development." There are many things which perhaps I should say, but I think this is enough to give you an impression of my attitude. I am sure I am reflecting the attitudes of the people who employ our graduates in San Diego State College.

Again, may I thank you for the privilege of appearing. If there are any questions I would be happy to try to answer them.

CHAIRMAN SEDGWICK: Are there any questions?

ASSEMBLYMAN HANNA: I have one, a couple of them I believe. First of all, would you say that the students, there there is any appreciable number of students that go to San Diego State College that would be qualified to go to the University at any one of its branches?

MR. ROBINSON: I presume you are talking about the field of engineering?

ASSEMBLYMAN HANNA: In engineering, precisely.

MR. ROBINSON: The answer is that we do transfer a number of students to the University of California, both at Berkeley and U.C.L.A., and that when they transfer their records show they do very good work. The programs at the university and its branches and at San Diego State are not exactly parallel so that if a student finishes four years at San Diego State College and transfers to Berkeley or to Stanford or to any other engineering school, frequently he needs to make up some specific courses which are required in their undergraduate program and not required

in ours. Maybe I should put this another way. Many standard engineering programs require the student to take as much as 140 or even 150 units. We require only 132. This incidently is an agreement with the State Department of Education. Also in our undergraduate program we include the little more intensive training in the humanities and related fields and so this means that they are lacking in some of the technical subjects which are included in a longer program, a program which concentrates a greater of its effort on the technical engineering subjects, so as I say when our students transfer to the university or to many other engineering schools, they sometimes have to make up work before obtaining full graduate status.

ASSEMBLYMAN HANNA: It means it takes them a little longer to get a graduate degree because they are filling up those deficiencies, is that correct?

MR. ROBINSON: Not always. There are exceptions to this. There are some schools whose engineering programs are quite similar to ours.

ASSEMBLYMAN HANNA: Would it be a fair statement to say that this matter of differentiation of function that we have been talking about has to be looked at squarely as a matter of degree, that there are probably just as many similarities of function in many respects?

MR. BOBINSON: Yes, sir, and this should be true. We do want it possible for junior college students to transfer to state colleges and we want it possible for state college students to

transfer to the university, or for transfers in the reverse direction to take place. And so there must be a great similarity.

ASSEMBLYMAN HANNA: I think that point is well to keep in mind because sometimes in speaking, emphasizing the differentiation of function, we might lose sight of the fact that there is a great similarity of function. One last question -- would you think that a new agreement arrived at on the basis of this study we have been referring to that is going on at the present time or out of any other study or suggestion would do any more for the relationship between the state colleges and the university than the 1953 agreement has done?

MR. ROBINSON: It just depends upon what the new agreement says.

ASSEMBLYMAN HANNA: I ask that question particularly because I think if I remember Mr. Vasche's comment about the interpretation, it reflected the fact that I believe your testimony has reflected that the state colleges adapt themselves insofar as possible to the needs of the community in which they are serving.

MR. ROBINSON: This is one of the legally defined objectives of the state colleges, that they operate as community colleges to meet community demands.

ASSEMBLYMAN HANNA: And then insofar as they operated under any agreement, they would follow this as their principle and main aim?

MR. ROBINSON: Yes, sir.

ASSEMBLYMAN HANNA: All right, that is all.

CHAIRMAN SEDGWICK: Any other questions?

ASSEMBLYMAN HEGLAND: I have two. First one is, you have been in San Diego State College a long time and you have a position of responsibility covering the field of physical sciences. To your knowledge did anyone ask you or anyone else at San Diego State College to participate democratically in the construction in 1953 of the agreement?

MR. ROBINSON: Well, this agreement has a long history as was explained yesterday. Long before the agreement was written there were many meetings of engineering and science people from the various state colleges, and we certainly had opportunity to express our views. San Diego is isolated geographically from Sacramento by considerable distance and our travel fund is very limited and consequently it was quite natural I think that the people who did most of the work in this were not San Diego people.

ASSEMBLYMAN HEGLAND: Thank you. The second question is do you feel that if your group in San Diego, were to participate in a couple day's study and discussion of this problem of whether or not you should offer a non-research program and master's degree for one year of graduate study, would this group of 120 trained people employed by the State of California feel in their judgment that San Diego State College should be encouraged to move ahead and give a one-year graduate study in the engineering field culminating in a master of science degree and perhaps would that be their recommendation? That is

my last question.

MR. ROBINSON: My answer would be yes.

CHAIRMAN SEDGWICK: If there are no other questions, I would like to thank you, Dr. Robinson, for your very fine testimony.

MR. ROBINSON: Thank you.

CHAIRMAN SEDGWICK: At this time I would like to introduce to the Committee Gerald A. Thomas, Chairman of the Natural Science Division, San Francisco State College. Earlier he didn't think he wanted to testify, but if you have a few remarks, we will be very happy to hear from you.

MR. THOMAS: Thank you. I do have a few remarks from a few notes I have been taking. I would like to compliment Mr. Robinson on the things he has just finished saying and bring to the Committee sort of an outsider's point of view, and I say outsider's point of view because eight months ago I didn't have the slightest idea that I would be in this part of the country or connected with this system of schools, the California State Colleges.

About five months ago I was on the way across country seeing all of the country for the first time because I had not been west of the Mississippi until I crossed it on the way to California last August. I can compare this school system in California that Mr. Robinson has been describing to you. I can compare it to schools in the south and in the east, schools that I have had connection with for quite a number of years. I can

say that I was well, almost amazed when I came here and found the very high-quality equipment, buildings, and staff that I found at the state college here across the Bay in San Francisco.

Now, of course, I looked into this situation as best I could before I decided to come across country, and I found a great deal about the particular college and the school system before I decided to come. It was all to the good.

Now, I have yet to see a system of schools or a single school where I have been able to say that I feel that the education dollar has been as efficiently spent as I see it being spent in the particular school that I am connected with, San Francisco State College, and I feel the same thing must be true in the other state colleges.

We have lack of frills in the buildings; we have splendid faculties; we have a pay scale that is not exceptionally high, but certainly comparable with the best in other sections of the country. We have buildings that are the best as a whole of any I have seen anywhere and I sort of resented sometimes the feeling that I see cropping up once in a while. I have felt I have seen here a time or two in the last two days, that the state college system should be relegated to a secondary position. This state college system is not second or secondary in any fashion. It is not secondly in any way. It is top, and if the state colleges have a job to do that is needed in the community and if those state colleges are doing that job or if they could rightfully do a job that is needed by the State or needed in this

crisis, I can't see why all means possible should not be taken to give them a spot that is respectable in the eyes of all. And if this requires being capable of asking for accreditation, let's give them the right to ask for accreditation.

Now, accreditation of engineering does not worry me as Chairman of the Division of Natural Science at San Francisco State College at the present time, because we have no engineering in our curriculum. I say this with respect to the accreditation in spite of a very strong feeling that I have that accreditation by some outside group is being given far too much weight. I strongly feel that. Now, I also feel that if that accreditation is going to bring about another deal that we should avoid it. A deal of any sort should be avoided at all costs even if it takes legislation to avoid it. And I think that any progress that our state schools make, whether it is towards a master's degree or whether it means getting accreditation or any progress that they make should be progress that is done cooperatively and by this I mean that there is a cooperation between the systems of higher education that will lead to a healthy and economical education at the higher level.

Secondly, another very strong feeling that I have is that research or non-research should be in the vernacular included out of any deal also. That is about all I have to say, sir.

ASSEMBLYMAN DOYLE: Well, I have got several questions. May I ask Mr. Thomas what part of the south you may have come from and are referring to in comparing our colleges with the

southern colleges?

MR. THOMAS: I came from Florida, sir.

ASSEMBLYMAN DOYLE: The state colleges you refer to in comparing out-of-state colleges to California state colleges --

MR. THOMAS: Actually, Florida itself has no state college system as such. I taught for a short time in a state college in Alabama and there is no comparison. That is sort of a --

ASSEMBLYMAN DOYLE: We hoped you would say that. We don't think there is any comparison.

MR. THOMAS: I don't mind admitting that I am a native of Alabama, born and raised there.

ASSEMBLYMAN DOYLE: My point is, we think we have a pretty fine group of state colleges here, too.

MR. THOMAS: You can tell that I feel the same way.

ASSEMBLYMAN DOYLE: All ten campuses, and we don't feel as members of the Legislature, and I doubt that any man or woman here in the room feels that we were second-class or second-rate. We go on the theory out here that everything is of the best.

MR. THOMAS: My idea on saying second-rate is simply that I have heard it said a number of times that we have the technical or occupational training to take in hand, whereas the training at the really high elite, perhaps research at professional levels, should be relegated to other institutions.

ASSEMBLYMAN DOYLE: Well that may or may not be, but I just wanted to clarify your remarks in my own mind when you started out as to just where we might be going. I think, too,

that as we go along we should make changes and have understandings within our state colleges. As you mentioned, you do not teach the subjects that they may teach in San Diego, or Chico or elsewhere. We have to have some leeway in setting these things up. Accreditation now of course again is something else. I think that Dr. Robinson mentioned that he felt that it was important or would be important to the student and to a school. Do you feel the same way about it?

MR. THOMAS: I do feel that it is important and both to the student and to the school. I think there is too much weight given to it as I mentioned a while ago. But nevertheless we must recognize that this weight is of some importance, too.

ASSEMBLYMAN DOYLE: Because industry looks at it in that light?

MR. THOMAS: That is right.

ASSEMBLYMAN DOYLE: I think, too, although Mr. McCaffrey clarified it yesterday in his opening statement that we don't want to put the blame as such on anyone, on any understanding or agreement we may now have. At the time the gentlemen, or the group or the committee that felt that was a good thing may have had reasons for it. I don't happen to agree with it now personally, and I hope that with the new group of people making a study of all of the operations of our colleges, particularly engineering and science will come up with an answer. That is all, Mr. Chairman.

CHAIRMAN SEDGWICK: Any other questions? Thank you very

much, Mr. Thomas.

MR. THOMAS: Thank you.

CHAIRMAN SEDGWICK: Now, I would like to say that we want to close this hearing this morning, but we have one or two more that would like to testify a few minutes, so we will run overtime past the hour of 12:00 before we close the hearing. Is there anyone in the audience that would like to say a few remarks to the Committee other than Dr. Gunderson? Let's hear from this gentleman here, then. We haven't heard from you. Would you step forward and state your name?

MR. MARRS: My name is Ralph Marrs. My position is Manager of Engineering Training with IBM in San Jose. I had not planned to testify at these hearings. There are two things, however, that I think need to be said so I would take this occasion to attempt to say them. They are perhaps in the nature of data showing that the University of California has been, if not unresponsive, at least very slow in meeting the needs of education in the lower peninsula area. Yesterday we heard testimony from five or six gentlemen from the University of California explaining the activities of the University in extension work and these figures were certainly quite impressive. If I succeeded in getting them down correctly we learned that for the fall semester of 1957, the University of California offered 2,172 extension courses. We also heard of the caliber of these courses, the type of men that teach the courses, the type of subjects covered and I must say that I was very impressed and I do not say

that at all sarcastically. I did rather wonder in my own mind, however, that if this much extension education is going on why is it that we feel our needs in extension education are not being met. So this morning before the hearing started I went through the catalogue of engineering and science organization by the University of California for the spring semester of 1958 and made a quick tabulation which I will give you the results of.

I found that of these -- now here you realize that we are comparing fall of 1957, which we heard about yesterday, against the spring of 1958, which is the data I worked with. The only thing I can conclude is if anything the percentage has expanded and the percentage ratios I quote to you will be a little bit on the high side and that in fact they are therefore safe rather than dangerous in what they show.

I found that of this total of 2,172 courses there are 94 which are in the field of engineering and science listed in this catalogue, which are offered from Redwood City south. This is a percentage of 3 per cent. I found also according to a further breakdown that of these courses 2.3 per cent of them were offered for credit, the remainder were not offered for credit. I found also that 1.3 per cent of these figures -- here I have a tabulation according to those that include Redwood City and those that don't. Let me go now to the figures which do not include Redwood City but are those courses offered below Redwood City. The reason I think this is important is that there is a

great percentage of the demand for education that exists far enough down the peninsula that Redwood City is not a very satisfactory place to hold a course. For example, we have heard from people from many of these companies. I will call off some of the ones I think employ considerably large numbers of engineers who would be interested in these courses.

First, there is General Electric Microwave, Palo Alto. My company, International Business Machines is in San Jose. Lockheed Aircraft, Missiles System Division, has locations in Sunnyvale, Palo Alto and San Jose. Stanford Research Institute is located in Menlo Park. Sylvania Electric Products Microwave Tube is in Mountainview. And then of course we have Westinghouse in Sunnyvale, plus others.

For the majority of these companies Redwood City is not a satisfactory place to hold an engineering extension course. It is just too far. On the basis of this we find that of the courses we heard about yesterday, that 2.8 per cent of them, which is the figure I gave you before, are offered for credit. Now this is not below Redwood City, this is all of the courses that are available here in the northern section.

Now, not considering credits, just considering how many courses in engineering and science there are offered below Redwood City, there are .6 courses offered below Redwood City, and if you consider how many courses there are below Redwood City that are also for credit, it comes out to a total of five courses or .2 per cent or one course out of every 450 offered by the

University extension.

Now this then is why some of us feel that our needs in education have not been met even with the grand extension offering that is given by the University of California. Now, right along that line it becomes hard for us to understand why it is that some of these courses are not offered for credit and not offered in the area that will serve the needs of these industries. Just picking out at random some of the courses which are not offered for credit and which we think perhaps should be: Infrared spectrometry principles and practices, chemical mass spectrometry, introduction to statistical spheridynamics. I won't belabor that point.

Now this is on undergraduate level. Let's move now very quickly to the graduate level of education. For more than two years the industries in this area working individually and also working through WCEMA Organization, the West Coast Electronic Manufacturers Association, and other organizations have been working and negotiating with the University of California to attempt to get graduate offerings for credit leading to a advanced degrees. We have read surveys and we have done everything that we have known how to do to get this educational need satisfied.

At the present time, or up to the present time, we have not yet succeeded in having one offering from the University of California. We have hopes that -- well perhaps even more than hopes of getting an offering in the fall semester of 1958. The

course that has been discussed is engineering analysis, a mathematics course, which is I believe extension X-230. We certainly we hope we get this course. We don't think that it is all that we need and we hope that we will get more and we will try to work tactfully and continuously with the University people to expand this offering and have more offerings leading to advanced degrees. Now, the thing that makes this seem to be serious is that in the two months recent surveys that we have conducted, one of them more than a year, and one of them about six months ago, we were able to show that there are fully as many engineers in the lower peninsular area who are qualified to do graduate work who want to do graduate work and who have indicated that they would sign up as candidates for the master's degree if there were courses available, that we have had more people in this category and notice that I am including the word qualified for graduate study -- we have more of these men that we have found than there are presently on the Berkeley campus studying graduate work in engineering. Now, we think that this then is a demand which should not be overlooked and one which should be met quickly.

I am very hopeful that anything I have said here will not upset the applecart as far as continuing with our negotiations for getting this program this fall and for making a realistic program. I think it is so important that this be said, however, that I felt I had no choice. I will be happy to answer any questions.

CHAIRMAN SEDWICK: Anyone have any questions?

ASSEMBLYMAN HANNA: Mr. Chairman, having in mind then the answer that was given by Mr. Robinson that the primary aim of the state colleges is to meet the needs of the community in which they operate, would you say that one of the great needs of the area served by the San Jose State College is to provide some means for a master's degree in engineering science?

MR. MARRS: Very definitely.

ASSEMBLYMAN HANNA: That is all.

CHAIRMAN SEDGWICK: Anyone else have any questions? Thank you very much for your testimony. Now then, Dr. Gunderson, I believe you wanted to make a few comments.

ADMIRAL SINGLETON: Mr. Chairman, if there is a possibility I would like to make a short statement, sir.

CHAIRMAN SEDGWICK: With reference to the testimony just given?

ADMIRAL SINGLETON: Yes.

CHAIRMAN SEDGWICK: If it is agreeable with Dr. Gunderson, okay.

ADMIRAL SINGLETON: I am Admiral C. T. Singleton, Head of the Engineering and Science Extension -- University Extension, University of California. Mr. Chairman, I would like to set the record straight because I think Ralph Marrs should know this, and I think you should, too. Mr. Marrs in computing his percentages a few minutes ago computed those percentages on the basis of the number of courses concerned with the physical sciences

and engineering given on the peninsula in reference to the entire statewide program of extension which included of course the Los Angeles offerings, the San Diego offerings and all others, which by the way also include Sacramento, and of course Los Angeles has a very heavy program.

I would like to repeat what I said yesterday, that the percentage of the courses given in the northern area in extension totalling 25 per cent of the total extension courses given in Northern California are the ones given on the peninsula between Redwood City and San Jose. And I stated yesterday that in one year that had increased some 9 per cent of the northern total to the 25 per cent. I also indicated yesterday that the Sacramento area in one year, which is an up-and-coming industrial center, has gone from 2 per cent to 9 per cent in the year. Now, I feel that I should point out to you some very peculiar circumstances which I refused to bring out yesterday, but I think you should know about.

At the request of some industries on the peninsula recently I initiated three review courses in engineering. These were things particularly requested by me by people in positions such as Mr. Marrs of IBM. They were to be reviews in preparation for the State licensing examination. For one of them I have 33 people which is a very excellent class. For two I have only 12, which is about four people below the point to even pay the way of those courses, but I am running them because I committed myself to these people in industry to do this. That is in

electrical engineering, and in mechanical engineering review I am running them at 12 people and at a loss in order to be of service. When I say a loss, I say again we pay our own way.

Now, I also would like to point out that yesterday I mentioned a course called the Fundamental Problems of Space Flight which was organized in Palo Alto last January and started on September 8, 1957. That was pre-sputnik. It is given by one of the best authorities that you can find. My total enrollment in that course today as I remember is 12 people. Now, if I offer it, which I am going to do again in February I will probably have 112, but I want to point out that I ran that course at a deficit in order to be of service in an area which I knew that they did not see. I saw it and other people saw it. So therefore, I want to point out that I think the record should be straight in this matter that not in all cases are we able to do what industry feels that they need when they are not supported to the extent that they need support in order to operate.

Now, there is another point here that was brought up on the credit versus non-credit. I don't want to enter the argument because I personally feel, and I say this not as a member of the staff of the University of California, I personally feel that an off-campus graduate program should be available on the peninsula now. Now, I feel that. However, I would like to point out that in all of this argument that has gone on about credit versus non-credit one of the main things is that industry has a rule that is almost applicable throughout industry, that they will not

assist their personnel financially in things that are non-credit. They may be the same course, they may be the same information, the same instruction, but if they are not credited, in most cases industry has not supported their people financially to take these courses. Now, for your information this modern physics course which is being given in Berkeley on Mondays and in San Diego on Tuesdays, was the first non-credit course presented in this area that was financially subscribed to in any manner by industry. In other words, they have changed their rule.

Now, the second one was space technology and industry broke its rule because in the north I cannot offer a lecture course for credits. Now, in the Los Angeles area where it can be offered for credit, one unit, industry supports it in full. I don't mean in full, I mean to about 50 per cent of the cost of students going. Therefore, why should industry then -- I merely ask this question -- refuse to change strictly a management rule when the instruction and the upgrading quality is the same. Now, therefore, I think it is necessary that you hear that part of the story because my figures were challenged and I don't think they can be challenged.

I can speak of some more that are similar in character that have been run at a loss in that area. Some I have to cancel in their entirety. Now, there is one other thing. I am sorry if I go back in time, but this argument is about what is upgrading and what is credit. The organization that I came from has been using this idea for years that you need upgrading

continuously, every man needs upgrading. I don't think anybody even in this place doesn't upgrade himself if he gets somewhwere. Now, he doesn't always ask for a college credit to do it.

Now, for instance, I was a victim of a so-called upgrading procedure. When I went back for additional study in engineering I was put into the operating course. Why? Because I stood in the middle of my class, not in the top. Now the people that stood at the top of my class academically capable of doing it, came to the University of California all the way from Maryland to take design engineering. Now, their course was somewhat different from mine. I studied plant operation, electrical and mechanical phases thereof, but everybody knew that one of these days some of those same operating people were going to be hiring these other fellows, and that is actually what happened with me. I beat them back into the service in a year and after a while they were working, some of them for me. But we didn't object to that. That was accepted. Therefore, I want to point out the fact -- and when I was back for this additional instructior was in 1932 and that is a fairly long time ago. If you go down to the Naval School in Monterey, of which I was a director, you will find a course called general ordnance. The man gets another bachelor's degree for that. But if he takes fire control where he ends up by going to the Institute of Technology for a year he gets a master's degree, and there is a difference between the people. One is an operational man and the other man is a design or research man.

Now, I merely want to point that out because as a taxpayer I still believe that there is a necessity for some kind of functional agreement within the State and I don't think that that means second-rate. I will admit that when I was put in the operating group it hurt me. But when I hired the man back that had gone to the other one, it didn't hurt me.

ASSEMBLYMAN HANNA: May I ask one question? Who determines whether or not you give credit for classes that you give under your extension program?

ADMIRAL SINGLETON: The departments of the University whom that program would normally fall under.

ASSEMBLYMAN HANNA: And do you know what standards they use to make that determination?

ADMIRAL SINGLETON: Yes.

ASSEMBLYMAN HANNA: What are they?

ADMIRAL SINGLETON: A credit course given under extension must meet the same standard of a course given, a similar course given on the campus. That is, it must be academic or scholastic in its presentation, rather than strictly professional in its presentation. Now what I mean by that is this, if I give a course in extension that is molded directly after say a physics course on the campus and if I use the same type of instruction, the same type of theory, the same type of background, then that is classified as a credit course. Now if I take a graduate course, that is on-campus and if I mold that graduate course to the point where it doesn't follow the graduate course on campus

in its entirety, but maintains the same level, I can give it as what we call an extension credit course, but it doesn't do you any good in using it for a master's degree. It may help you if you submit your transcript of that course to gain entrance or admission to the University. So now most of the courses that we develop which are from a particular interest to industry are in the 800 series as we call them. They are strictly postgraduate upgrading professional courses.

ASSEMBLYMAN HANNA: Non-credit?

ADMIRAL SINGLETON: That is right.

ASSEMBLYMAN HANNA: I see. Thank you very much.

ASSEMBLYMAN ANDERSON: Admiral, are some of the courses that you give identical to the formal postgraduate study courses at the University and still not available for credit?

ADMIRAL SINGLETON: Yes, there are some.

ASSEMBLYMAN ANDERSON: There are some like that?

ADMIRAL SINGLETON: There are some like that. The only thing is that you must recognize that a graduate course really is no good in any university unless it is a part of a program and that program has to be balanced for the individual student. Now, we do give some courses in extension which are practically duplicate of a graduate course which is a part of a program on-campus, and in almost all cases we put the so-called 400 number on to indicate to the student that that is at a graduate level, so that we won't have somebody with too low a prerequisite trying to enter the class.

ASSEMBLYMAN ANDERSON: If that off-campus student later develops his graduate program can he use this non-credit course and get credit for it?

ADMIRAL SINGLETON: No, all he can do when he applies for admission is put down that transcript of that course and if he made a good mark in it, it would help him probably bring up other marginal areas in the transcript to gain only admission as a graduate student, but it would not help him in his total unit credits required.

ASSEMBLYMAN ANDERSON: You indicated that you believe there should be an off-campus graduate program. Do you think in this situation that credit might be included with it?

ADMIRAL SINGLETON: Yes, when I say program off-campus I mean a credit program run by the department of the University and only administered by extension.

ASSEMBLYMAN ANDERSON: Are you using your good offices to encourage the adoption of this program?

ADMIRAL SINGLETON: Yes, Mr. Anderson, I have been. I have tried to do as well as I could to administer the Livermore programs in order that they might prove successful as an off-campus offering. This is a trial as you know at the University at Livermore, and we are offering engineering, science, mathematics and physics programs there.

ASSEMBLYMAN ANDERSON: Good luck to you in this undertaking.

ADMIRAL SINGLETON: Thank you, sir.

CHAIRMAN SEDGWICK: Thank you very much. Now, Dr. Gunderson

MR. GUNDERSON: Norman O. Gunderson, Head of the Division of Engineering, San Jose State College. At 11:00 o'clock I had a statement I wanted to make. At 11:30 I cut it down to 10 and I am down to 3 minutes now. But I would like to make just a few comments on comments that arose out of Chairman Sedgwick's questions as to the availability of college teachers, and I would like to make a pitch for higher salaries in an effort to increase the prestige of college teachers. The need is tremendous and I would like to call your attention to a publication that has just come out entitled, "Teachers supply and demand in colleges and universities," put out by the National Educational Association. There are extracts of this in this publication which I won't read. But it is sort of discouraging when they point out that the ratios of, or the people with advanced degrees now are not going into teaching, and it points out that in 1953-54 only 10.4 of the members of the teaching staff at the University of California did not possess at least a master's degree, but in that year 19.2 per cent of the new instructors had not reached the master level, and in 1956-57 the percentage had risen to 23.1 per cent. So that every year it is just increasingly difficult to get competent people to teach and you are finding it almost essential that you take people without this added training in order to fill vacancies.

I would like to point out that San Jose State College always seems to be stirring up something. We are coming up trying to influence you into to providing money for faculty

salary increases. We are not making the original study, we are taking extract out of publications such as the report of the President which emphasizes salaries must be raised 100 per cent within ten years.

And we would like, at least I would like to disagree with Vernon Westburg when he points out there should be a difference in salaries based on the fact that the professor works nine months and the industrial works twelve. You have to provide some opportunity for the college teacher to improve himself and he is so busy during the usual nine months he doesn't have a chance to do this. His salary should be high enough that he could take the summer months and do some research and preparation for the coming fall semester. I would like to point out that I visted IBM plant in San Jose a few weeks ago and came back very discouraged in thinking about the prospect of trying to lure people away from industry.

In looking at the facilities that they are providing for their scientists and engineers, they are nice private offices for each individual looking out on grassed in patios, which have lounge chairs to which the people can retire and think about their serious problems. They have wonderful libraries and private rest room facilities. Now this is one thing I would like to put across that you could increase the lure of teaching for a lot of people by providing these little frills Mr. Thomas said we were not getting. I would like to discourage this efficient use of the dollar in some respect and ask you to provide

lounges in some of the buildings for faculty and you do provide private rest rooms for the faculty. This is against the rules of the Division of Architecture and the Department of Finance. You could affect the interest of people in teaching by providing these little prestige things. That is about what I had to say.

CHAIRMAN SEDGWICK: Thank you very much.

ASSEMBLYMAN HEGLAND: Mr. Gunderson, one brief comment here. In general I am sympathetic with your testimony and you know this and members here all feel we should have higher salaries for college teachers and all that, but in this one sentence you started the sentence by saying that the percentage of -- the import of your sentence was that we were getting progressively lower degree-holding faculties and that of course we were not able to get as competent people. Now, I think it is most risky to equate, and I see this same trend in the junior college, and I think we are working against the education in the long run to try to equate competence with the degree held by the individual. Now, it is true that if you take one-thousand Ph.D.'s you will have a higher level of competence than if you have one-thousand master degrees, but I think it is also true that most of the studies in the field show that you need some balance and that just automatically increasing the degree you do not increase the competence of your staff necessarily.

MR. GUNDERSON: I would agree with you that the teaching ability of the individual does not depend upon his advanced degrees. You can have an excellent teacher with but a bachelor

degree and a very sorry teacher with a Ph.D. degree, but the fact that he has at least going beyond the master's degree does indicate that he has accumulated a little more knowledge. He has a little persistence and he has been exposed to more.

CHAIRMAN SEDGWICK: But, it does determine the amount of the salary he gets -- that is the degree has usually determined the amount of salary he gets, hasn't it?

MR. GUNDERSON: In the state college system they used to have I think four classifications, depending on the education the person had. This has been reduced now to two classes, one for the person with the Ph.D. and the other classification for anyone else.

CHAIRMAN SEDGWICK: It should be determined by the amount of ability he has in teaching, I think.

MR. GUNDERSON: Right. I think there is no restriction on promotion based upon degree held. There used to be.

CHAIRMAN SEDGWICK: Any other questions? Thank you very much, Dr. Gunderson. I certainly sympathize with the salary situation, but in my time in the State Legislature I haven't found any elastic in the budget yet. There may be some there, but it hasn't -- it doesn't stretch too far. Now, is there anyone in the audience that would like to be heard before we close?

MR. ARNOLD: Do I understand you will not reconvene this afternoon? I have about a three minute statement I would like to make.

CHAIRMAN SEDGWICK: Will you state your name and association?

MR. ARNOLD: My name is J. Howard Arnold. My address is 1058 Pomona Avenue, Berkeley 6. I am a consulting engineer. My profession is chemical engineering. I graduated from the University of Minnesota some 30 years ago. I have spent half of that period, about 15 years in university teaching, and the other half has been variously spent as a consultant in industrial practice, and I have a few points which I think may be of interest to the Committee.

I have incidentally a doctor's degree in engineering from the Massachusetts Institute of Technology and I have been interested in teaching both during the 15 years that I taught and in the subsequent years since I left that profession during the war. My first point is that the shortage of engineers that we read so much about is unreal. There is perhaps a shortage of people just coming out of colleges whom I would not call engineers at all, but really apprentices to the engineering profession.

In the course of time they will become engineers, but you will notice that the bidding now days which apparently has collapsed in recent weeks and months is not for the experienced engineer who is 30, 40, 50 years old, but for the man who is just out of college. In fact, there has been a rather firm barrier at the age of about 35 with many companies to the employment of engineers at the same time they protest that they are desperately in need of engineering talent. You see in recent years also the limitation zero to five year's experience

in the requirements. Well now, that sets an age limit really of about 27 to 30 years on prospective employees. My suggestion is that if there was a real shortage of engineers as there is in some areas such as the aeronautical industry and in some geographical areas like Texas, the age limitation would not be held. Now the law of supply and demand works very well there. The price is a result of balance or imbalance between supply and demand, and I think you can judge pretty well the actuality of the shortage of engineers by the prices that are offered for engineering services.

And if you compare what the engineer is getting today in comparison with the industrial worker you find that the worker has gone ahead much faster than the engineer. Although when I graduated 30 years ago bachelor men were getting $150 a month, and they are getting three times that now, or $450 or more, and they still haven't caught up with the progress that the industrial worker has made. Salaries in general have been retarded especially for older employees. The younger men just out of college are doing much better than the older men who have been out many years. There is in fact a cut-off point which some years ago was about $600 a month, I think it is probably $700 or $800 now, but the engineer who wants to make money cannot stay in the engineering profession. He must become an industrial administrator. Industrial management in fact is what takes most of the engineers in later life. We are not training them to do engineering work primarily. Most of the graduates in engineering will become

industrial managers of one sort or another.

Now, on the question of accreditation, my feeling is that if San Jose State or any institution at all is to give a course in engineering, it ought to be accredited. Now accrediting standards are rather low and if an institution is not accredited that means to me just one thing, that the curricula must be pretty poor and I think that the course should be either given in such a way that it is eligible for accreditation or it should not be given at all.

I noticed just the other day that the Medical School of the University of California has moved all its teaching now into San Francisco with increased facilities. It is now able to take care of 100 entering medical students instead of 76. Now, that reminded me of the situation in Dean O'Brien's College of Engineering at Berkeley just after the war with the great influx of veterans. He was asked how many students he could take care of in the college and after conference with the faculty it was decided that the college was intended to take care of 1800 students, but in view of the emergency they could expand that to 2400. Well, the higher administration in its superior wisdom admitted 3600 or 100 per cent overload. You find nothing of that sort happening in the medical schools of the country. We have only about 80 medical schools in this country, and 40 of them are privately operated, and 40 of them are state supported. But, you find that the American Medical Association is not permitting any great expansion in the number of physicians, and

the Dental Association is not permitting any great expansion in the number of dentists, and the engineering societies are urging the expansion in the training of engineers.

Now, a friend of mine has both a Ph.D. in mechanical engineering and an M.D. and he pointed out to me recently that the aptitudes are the same for medicine and engineering to a great extent. We are drawing our students for both those fields from the same school of talent which is limited and when we divert young men and women into engineering where they are not really needed we keep them away from medicine where they could be used to much better effect. I notice recently also that the Russians who are now the exemplars in engineering, that we are supposed to imitate, have one physician for each 650 people, whereas we have one physician for each 1400, but you will notice no effort on the part of the American Medical Association to increase the number of doctors to match what Russia has. And I would suggest to the Legislature that it bend its every effort not to expand the engineering instruction in this State, but to expand the instruction in fields where it is really needed, such as medicine and denistry. We don't need more engineers. We merely need better utilization of those we have trained and those which we are training. Thank you.

CHAIRMAN SEDGWICK: Thank you very much. Any questions? Thank you. Anyone else would like to be heard? If not, in closing this hearing I want to thank all of you people that participated in it. As you know, the purpose of this

Subcommittee is to find all the facts pertaining to the accreditation of the engineering courses in the state colleges. We have had the opportunity to hear from the State Department of Education and from the state colleges and from the universities and I think that we have brought out many facts in this particular subject, and it is my personal opinion that there hasn't been any opposition to speak of in regard to the accreditation of the state colleges. I feel most of the testimony that we have heard in both of our hearings has been towards the belief that these state colleges or at least some of them should qualify to be accredited in the field of engineering. I also feel that the higher education groups in the State should be coordinated as far as the junior colleges and the states colleges and the universities are concerned. I think that they should operate in harmony and not be too conflicting in their various courses. We spend a lot of money on education in our State and I think that there should not be too much duplication. I am waiting with great expectations for the report of the Liasion Committee in regard to their view on accreditation of state colleges. I feel that the time and conditions have changed. I think we are living under a different era than we did in 1953 when this agreement was revised. I think that we do need changes in our system as we go along. I know Mr. Gunderson spoke of the nice offices that industry has for their people and the nice rest rooms and sometimes I think that with too many of those things some of our younger generation becomes a little soft. Now

Admiral Singleton and myself and maybe a few others in the room remember when we didn't have nice rest rooms in the buildings and you can see that we both come from very sturdy stock, and expect to be around here for a good many years. So in closing, again I wish to thank you for participating in our hearings. I am sure much good has come out of these two hearings.

(Thereupon the hearing was adjourned.)

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REPORTER'S CERTIFICATE

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This is to certify that I, Alice Book, a Certified Shorthand Reporter, was present at the time and place the foregoing proceedings were had and taken before the Assembly Committee on Education, Subcommittee on Higher Education, California State Legislature, in Oakland, California, on January 22 and 23, 1958, and that as such reporter I did take down said proceedings in shorthand writing, and that thereafter I caused the shorthand writing to be transcribed into longhand typewriting, and that the foregoing pages beginning at the top of page 1 to and including line 7 on page 222 hereof, constitute a true, complete, accurate and correct transcription of the aforementioned shorthand writing.

Dated this 6th day of February, 1958.

Alice Book

Certified Shorthand Reporter

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